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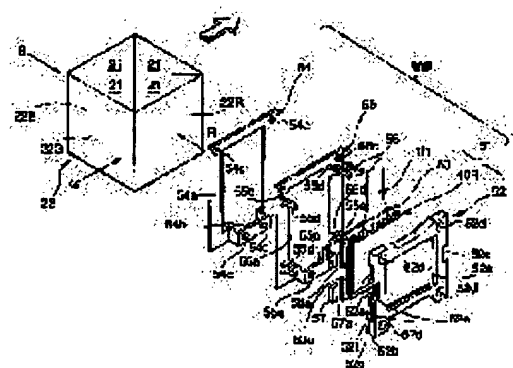
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(54) PROJECTION TYPE DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a mechanism that can fit a light bulb in at appropriate state to a light incident face of a prism composite body.

SOLUTION: A liquid crystal panel unit 50R is fitted to a light incident face of a prism composite body 22. This unit 50R has a panel frame plate 51 for holding a liquid crystal panel 40R, and a fixed frame plate 54 adhesively fixed to the light incident face 22R. The panel frame plate 51 is screw-fastened to the side of the fixed frame 54 through an intermediate frame plate 55. The position of the panel frame plate 51 is adjusted to the light incident face 22R using a wedge 57 so as to be able to positively position and fix the liquid crystal panel 40R held thereto. The slippage of picture element adjustment is thereby suppressed, and focusing can be accurately performed to easily obtain high precision. In addition, enlargement of the prism composite body can be avoided while making the failed liquid crystal panel replaceable.



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CLAIMS**[Claim(s)]**

[Claim 1] Decompose the flux of light from the light source into the flux of light of two or more colors, make each colored light bundle correspond to image information through a light valve, modulate it, and the modulation flux of light of each color after becoming irregular is re-compounded with a photosynthesis means. The fixed frame plate which is the projection mold display which carries out expansion projection on a projection side through a projection means, and is fixed to the optical plane of incidence of said photosynthesis means, The projection mold display characterized by having the light valve frame board holding said light valve, a fixed means to fix this light valve frame board to said fixed frame plate removable, and a positioning means to perform positioning of said light valve.

[Claim 2] It is the projection mold display characterized by equipping either [at least] said light valve frame board or said fixed frame plates with a perimeter [wrap] wall for 4 rounds of said light valve in claim 1.

[Claim 3] It is the projection mold display characterized by including controller material for said positioning means adjusting the location of said light valve in claims 1 or 2.

[Claim 4] The projection mold display characterized by forming a controller material guidance means in said light valve frame board in claim 3.

[Claim 5] It is the projection mold display characterized by having at least one engagement section used in case said controller material carries out chucking of the controller material concerned in claim 3.

[Claim 6] Said positioning means is a projection mold display characterized by being prepared near the center of a flank : said light valve frame board counters in claims 1 or 2.

[Claim 7] It is the projection mold display characterized by having the engagement section for one [at least] plate of said fixed frame plate and said light valve frame boards carrying out chucking of the plate concerned in claims 1 or 2.

[Claim 8] It is the projection mold display which it has further the middle frame board arranged between said fixed frame plates and said light valve frame boards in claims 1 or 2, and this middle frame board is fixed to said fixed frame plate by said fixed means, and is characterized by pinching said light valve between said light valve frame boards and said middle frame boards.

[Claim 9] The projection mold display characterized by having the tacking means for tacking carrying out of said middle frame board and said light valve frame board further in claim 8.

[Claim 10] It is the projection mold display characterized by including the engagement protruding piece which formed said tacking means in the plate of either said middle frame board and said panel frame board in claim 9, and the engagement hole formed in the plate of another side.

[Claim 11] Said engagement protruding piece inserted in said engagement hole in claim 10 is a projection mold display characterized by carrying out adhesion immobilization.

[Claim 12] It is the projection mold display characterized by including the controller material to which said positioning means adjusts the location of said light valve in claim 8.

[Claim 13] The projection mold display characterized by forming a controller material guidance means in said light valve frame board in claim 12.

[Claim 14] It is the projection mold display characterized by having at least one engagement section used in case said controller material carries out chucking of the controller material concerned in claim 12.

[Claim 15] Said positioning means is a projection mold display characterized by being prepared near the center of a flank said light valve frame board counters in claim 8.

[Claim 16] The projection mold display characterized by pinching said light valve between said light valve frame boards and said fixed frame plates in claim 1.

[Claim 17] It is the projection mold display characterized by said light valve being a liquid crystal light valve in either of claims 1-16.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention decomposes the white light bundle from the light source into red, blue, and 3 green colored light bundles, each of these colored light bundles are made to correspond to image information through light valves, such as a liquid crystal panel, and modulates them, re-compounds the modulation flux of light of each color after becoming irregular with a photosynthesis means, and relates to the projection mold display which carries out expansion projection on a projection side through a projection means.

[0002] This invention relates to the anchoring device of a liquid crystal panel over the prism composition object which constitutes the photosynthesis means in the projection mold display of this format in more detail.

[0003]

[Description of the Prior Art] In the projection mold indicating equipment of the above-mentioned configuration, the liquid crystal panel as a light valve is attached in the optical plane of incidence of each colored light bundle of the prism composition object which is a photosynthesis means. As a device for attaching a liquid crystal panel in a prism composition object, there is a thing of the format indicated by JP,6-118368,A, for example. By the anchoring device of this format, to the optical plane of incidence of a prism composition object, the liquid crystal panel as a light valve sticks directly, and is being fixed by adhesives.

[0004] Especially when adhesion immobilization of the light valve is carried out, the device for mutual pixel doubling adjustment (alignment adjustment) of two or more light valves which modulate red and the light separated green and blue, and the device adjusted so that each image formation side used as a photographic subject may be located in the focal permission depth of a projection lens (focal adjustment) can be omitted. Therefore, small and lightweight-izing of the optical system of a projection mold display, and reduction of components mark are realizable.

[0005]

[Problem(s) to be Solved by the Invention] However, when adhesion immobilization of the light valve is carried out directly at the optical plane of incidence of a prism composition object, the following technical problems which should be solved occur.

[0006] When outdoor daylight trespasses [1st] upon the interior of equipment from the exterior, there is a possibility that the outdoor daylight concerned may carry out incidence to a light valve. When such an invasion light is received, there is a possibility that each component of a light valve may malfunction.

[0007] Since the evil of damaging it occurs, it is not desirable to deal with it, where a light valve is touched [2nd] directly. For example, in case a light valve is pasted up on a prism composition object, when chucking of the light valve is directly carried out with a fixture, there is a possibility that the edge of a light valve, an angle, etc. may be damaged. Moreover, when using a weak light valve for static electricity like a liquid crystal panel, it is not desirable to do the activity which a worker has a light valve soon and sticks on a prism composition object.

[0008] A defect etc. may generate the light valve pasted up on the prism composition object the 3rd in a part of the pixel by aging. When a defect occurs in a light valve, it is necessary to exchange it for a new thing. However, a light valve is difficult to exchange only a light valve with a defect for a prism composition object, since adhesion immobilization is carried out. That is, it is not easy to remove only the liquid crystal panel by which adhesion immobilization is carried out there, without damaging the optical plane of incidence of a prism composition object. For this reason, for example, it may have to exchange also including a prism composition object, and is not economical.

[0009] The technical problem of this invention is to realize the projection mold display equipped with the anchoring device of the light valve which can cancel such a technical problem.

[0010]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention decomposes the flux of light from the light source into the flux of light of two or more colors, and make each colored light bundle correspond to image information through a light valve, it modulates it, and the modulation flux of light of each color after becoming irregular is re-compounded with a photosynthesis means. In the projection mold indicating equipment which carries out expansion projection on a projection side through a projection means, while protecting the perimeter of a light valve so that invasion of outdoor daylight, breakage, etc. may not break out, the configuration which does not have to carry out adhesion immobilization of the light valve directly to a photosynthesis means is adopted.

[0011] That is, in this invention, the configuration which has the fixed frame plate fixed to the optical plane of incidence of said photosynthesis means, the light valve frame board holding said light valve, a fixed means to fix this light valve frame board to said fixed frame plate removable, and a positioning means to perform positioning of said light valve is adopted.

[0012] Moreover, in addition to the above-mentioned configuration, the configuration which forms a perimeter [wrap] wall for 4 rounds of said light valve with either [at least] said light valve frame board or said fixed frame plates is used for this invention.

[0013] Said positioning means can be considered as the configuration containing the controller material for adjusting the location of said light valve. In this case, it is desirable to form a controller material guidance means in said light valve frame board.

[0014] As for said controller material, it is desirable to have at least one engagement section used in case chucking of the controller material concerned is carried out so that controller material can be easily dealt with with a fixture etc.

[0015] Moreover, as for said positioning means, it is desirable to prepare near the center of a flank said light valve frame board counters. If it does in this way, the stress concentration by heat deformation of the member for positioning etc. is avoidable.

[0016] It is desirable to, equip said fixed frame plate and said light valve frame board with the engagement section for carrying out chucking of the plate concerned on the other hand, so that a fixed frame plate and a light valve frame board can be easily dealt with with a fixture etc.

[0017] Next, in addition to said fixed frame plate and said light valve frame board, in this invention, the configuration equipped with the middle frame board arranged among these is adopted. In this case, it is fixed to said fixed frame plate by said fixed means, and this middle frame board is fixed after having been positioned by said light valve frame board with said positioning means.

[0018] In this case, it is desirable to position said middle plate by which adopted the configuration with the tacking means for tacking carrying out of said middle plate and said light valve frame board, and it was tacking carried out with the tacking means concerned, and said light valve frame board with said positioning means. If it does in this way, since positioning can be performed in the condition of having been tacking carried out, positioning can be performed easily.

[0019] Said tacking means can be considered as the configuration containing the engagement protruding piece formed in the plate of either said middle frame board and said light valve frame board, and the engagement hole formed in the plate of another side. In this case, what is necessary is just to tacking carry out of between these with adhesives.

[0020] Here, when it has the middle frame board, said positioning means can adopt the configuration containing the controller material which adjusts the location of said light valve. Moreover, the configuration which established the controller material guidance means is employable as said light valve frame board. Furthermore, said controller material can be considered as the configuration equipped with at least one engagement section used in case chucking of the controller material concerned is carried out. Said positioning means can be done in the configuration prepared near the center of a flank said light valve frame board counters further again.

[0021] On the other hand, in this invention, the configuration which pinches said light valve between said light valve frame boards and said fixed frame plates is also employable.

[0022] Thus, in the projection mold indicating equipment of constituted this invention, the light valve is held by the light valve frame board. Moreover, a fixed frame plate is fixed to the optical plane of incidence of a photosynthesis means, and the light valve frame board by which the light valve was held is being directly fixed removable through the middle frame board to this fixed frame plate.

[0023] Therefore, when a defect occurs by aging, a light valve removes the light valve frame board holding a light valve from the fixed frame plate currently fixed to the photosynthesis means, and should just attach the light valve frame board holding a new light valve in a fixed frame plate. Thus, since the light valve is not being directly fixed to the photosynthesis means, exchange of a light valve can be performed easily and the front face of a photosynthesis means is not damaged at the time of exchange.

[0024] Moreover, with the projection mold indicating equipment of this invention, since the perimeter is protected by

the light valve frame board, a light valve does not work in the time of anchoring to a photosynthesis means etc., where a light valve is touched directly. Therefore, breakage of a light valve can be prevented. Moreover, in the condition of being used being included in a projection mold indicating equipment, since the periphery is covered with the light valve frame board, there is also no possibility that outdoor daylight may invade and malfunction may occur.

[0025] Moreover, liquid crystal equipment can be used as the above-mentioned light valve. This invention is weak to static electricity, and, in the case of a lifting or cone liquid crystal equipment, especially effective in malfunction to invasion of outdoor daylight.

[0026] Furthermore, as the above-mentioned light valve, there are a thing of a light transmission mold and a thing of a light reflex mold. When using the light valve of a light reflex mold, it is common to also play a role of an optical separation means by which a photosynthesis means decomposes the flux of light from the light source into the flux of light of two or more colors.

[0027] Although two kinds of tooth-back projection mold displays with which projection is performed from the direction where the front projection mold display with which projection is performed as a projection mold display from the side which observes a projection side and the side which observes a projection side are opposite exist, this invention is applicable to any type. In addition, although a fixed frame plate, a light valve frame board, a fixed means, and a positioning means will be used for the field of a dichroic prism and positioning immobilization of the light valve will be carried out when using a dichroic prism as the above-mentioned photosynthesis means, this fixed structure can consider applying solid state image sensors, such as CCD, to the structure which carries out positioning immobilization at color-separation prism in a camera etc.

[0028]

[Embodiment of the Invention] The projection mold display which applied this invention to below with reference to the drawing is explained.

[0029] (Whole configuration) The appearance of the projection mold display which applied this invention is shown in drawing 1. The sheathing case 2 of the projection mold display 1 of this example is carrying out the rectangular parallelepiped configuration. Fundamentally, this sheathing case 2 consists of front cases 5 where the front face of equipment is specified as the upper case 3 and the lower case 4. From the center of the front case 5, the part by the side of the tip of the projection lens unit 6 has projected.

[0030] Arrangement of each component in the interior of the sheathing case 2 of the projection mold display 1 is shown in drawing 2. As shown in this drawing, in the interior of the sheathing case 2, the power supply unit 7 is arranged at that back end side. The light source lamp unit 8 and the optical unit 9 are arranged in the location which adjoined the before [equipment] side rather than this. The end face side of the projection lens unit 6 is located in the center by the side of before the optical unit 9. On the other hand, the interface substrate 11 in which the input/output interface circuit was carried towards the equipment cross direction is arranged, and the video substrate 12 in which the video signal processing circuit was carried is arranged in parallel with this at one optical unit 9 side. Furthermore, the control board 13 for equipment drive control is arranged at the light source lamp unit 8 and optical unit 9 bottom. Loudspeakers 14R and 14L are arranged at the angle of right and left by the side of the equipment front end, respectively.

[0031] In the center by the side of the top face of the optical unit 9, inhalation-of-air fan 15A for cooling is arranged, and fan 15B for circulation for the circulating flow formation for cooling is arranged in the center by the side of the base of the optical unit 9. Moreover, the ventilating fan 16 is arranged in the equipment side face which is the rear-face side of the light source lamp unit 8. And the auxiliary cooling fan 17 for attracting the airstream for cooling from inhalation-of-air fan 15A in a power supply unit 7 is arranged in the location facing the edge of the substrates 11 and 12 in a power supply unit 7.

[0032] Furthermore, the floppy disk drive unit 18 is arranged in the location on the left-hand side of [the] equipment right above [of a power supply unit 7].

[0033] (An optical unit and optical system) The part of the optical unit 9 is shown in drawing 3 (A). As shown in this drawing, the optical unit 9 has the composition that optical elements other than prism unit 20 which constitutes that color composition means were pinched and held from the upper and lower sides among the up-and-down light guides 901 and 902. The upper light guide 901 and the bottom light guide 902 are being fixed to the upper case 3 and lower case 4 side by the lock screw, respectively. Moreover, the light guide plates 901 and 902 of these upper and lower sides are being fixed by the lock screw as well as the prism unit 20 side.

[0034] the rear face of the thick head plate 30 whose prism unit 20 is a dies casting plate -- a lock screw -- it is fixed. Similarly the end face side of the projection lens unit 6 as a projection means is being fixed to the front face of this head plate 30 by the lock screw. Therefore, in this example, the head plate 30 is inserted and it has structure fixed so that the prism unit 20 and the projection lens unit 6 might be united. Thus, the rigid high head plate 30 is inserted and the

components of these both sides are unified. Therefore, even if an impact etc. acts on the projection lens unit 6 side, a location gap does not occur in the member of these both sides.

[0035] The outline configuration of the optical system included in the projection mold display 1 is shown in drawing 3 (B). The illumination-light study system 923 by which the optical system of this example is constituted from a light source lamp 805 and integrator lenses 921 and 922 it is [lenses] a homogeneity illumination-light study component, The color separation optical system 924 which separates into red, green, and each blue colored light bundles R, G, and B the white light bundle W by which outgoing radiation is carried out from this illumination-light study system 923, It considers as the liquid crystal panels 40R, 40G, and 40B of three sheets as a light valve which modulates each colored light bundle, and the color composition optical system which re-compounds the modulated colored light bundle, and consists of a prism composition object 20 and a projection lens unit 6 which carries out expansion projection of the compounded flux of light on a projection side. Moreover, it has the light guide system 927 which leads the blue glow bundle B to corresponding liquid crystal panel 40B among each colored light bundle separated according to the color separation optical system 924.

[0036] As a light source lamp 805, a halogen lamp, a metal halide lamp, a xenon lamp, etc. can be used. The homogeneity illumination-light study system 923 is equipped with the reflective mirror 931, and it turns optical-axis 1a of the outgoing radiation light from an illumination-light study system to equipment front, and he is trying to bend it at a right angle. This mirror 931 is pinched and it is arranged at the condition that the integrator lenses 921 and 922 intersect perpendicularly forward and backward.

[0037] The color separation optical system 924 consists of a bluish green reflective dike lock mirror 941, a green reflective dichroic mirror 942, and a reflective mirror 943. In the bluish green reflective dichroic mirror 941, the blue glow bundle B included there and the green light bundle G are first reflected by the right angle, and the white light bundle W goes to the green reflective dichroic mirror 942 side. This mirror 941 is passed, it is reflected by the right angle by the back reflective mirror 943, and outgoing radiation of the red flux of light R is carried out to the prism composition object 20 side from the outgoing radiation section 944 of the red flux of light. In the green reflective dichroic mirror 942, the green light bundle G is reflected by the right angle, and outgoing radiation of the blue and the green flux of lights B and G which were reflected in the mirror 941 is carried out to a color composition optical-system side from the outgoing radiation section 945 of a green light bundle. Outgoing radiation of the blue glow bundle B which passed this mirror 942 is carried out to a light guide system side from the outgoing radiation section 946 of a blue glow bundle. In this example, it is set up so that all the distance from the outgoing radiation section of the white light bundle of a homogeneity illumination-light study component to the outgoing radiation sections 944, 945, and 946 of each colored light bundle in the color separation optical system 924 may become equal.

[0038] Condenser lenses 951, 952, and 953 are arranged at the outgoing radiation side of the outgoing radiation sections 944, 945, and 946 of each colored light bundle of the color separation optical system 924, respectively. Therefore, incidence of each colored light bundle which carried out outgoing radiation from each outgoing radiation section is carried out to these condenser lenses 951, 952, and 953, and it is made parallel.

[0039] Thus, among each colored light bundles R, G, and B made parallel, incidence of red and the green flux of lights R and G is carried out to liquid crystal panels 40R and 40G, they are modulated, and the image information corresponding to each colored light is added. That is, switching control of these liquid crystal panels 40R, 40G, and 40B is carried out by the non-illustrated driving means with the picture signal corresponding to image information, and, thereby, the modulation of each colored light which passes through this is performed. Such a driving means can use a well-known means as it is. On the other hand, the blue glow bundle B is led to liquid crystal panel 40B which corresponds through the light guide system 927, and a modulation is similarly performed in here according to image information. In addition, what used poly-Si TFT as a switching element can be used for the liquid crystal panels 40R, 40G, and 40B of this example.

[0040] The light guide system 927 consists of the incidence side reflective mirror 971, an outgoing radiation side reflective mirror 972, a middle lens 973 arranged among these, and a condenser lens 953 arranged to the near side of liquid crystal panel 40B. The blue glow bundle B becomes the longest, therefore the quantity of light loss of this flux of light of distance from the optical path length 805, i.e., the light source lamp, of each colored light bundle to each liquid crystal panel increases most. However, quantity of light loss can be controlled by making the light guide system 927 intervene. Therefore, the optical path length of each colored light bundle can be substantially made into equivalence.

[0041] Next, incidence of each colored light bundle modulated through each liquid crystal panels 40R, 40G, and 40B is carried out to the prism composition object 22, and it is re-compounded here. Color composition optical system consists of these examples using the prism composition object 22 which consists of a dichroic prism. Expansion projection of the color picture re-compounded here is carried out on the projection side 7 in a position through the projection lens unit 6.

[0042] (Structure of a prism unit and a head plate) The head plate 30 and the prism unit 20 attached in this head plate 30 are taken out in drawing 4, and it is shown in it. As shown in this drawing, the head plate 30 consists of fundamentally a perpendicular wall 31 prolonged with a perpendicular posture towards the cross direction of equipment, and a bottom wall 32 horizontally prolonged from the lower limit of this perpendicular wall 31. Opening 31b of a rectangle for the outgoing radiation light from the prism unit 20 to pass is formed in the perpendicular wall 31. Moreover, many reinforcing ribs are formed in this perpendicular wall 31, and that rigidity is raised to it. Where alignment of this perpendicular wall 31 is inserted and carried out, the prism unit 20 and the projection lens unit 6 are being fixed (refer to drawing 3 (A)). Therefore, such integrity is high, and even if impulse force etc. acts, there are very few possibilities that a mutual location gap may occur.

[0043] The prism unit 20 is installed in the top face of the bottom wall 32 of the head plate 30. The prism unit 20 is equipped with the prism composition object 22 of the rectangular parallelepiped configuration constituted by joining those slant faces mutually in four prism 21 which carried out the cross section of a rectangular equilateral triangle, and (refer to drawing 5) and the prism support plate 33. It is fixed to the front face of the prism support plate 33 by means, such as adhesion, and the prism support plate 33 attaches the pars basilaris ossis occipitalis of the prism composition object 22 in the bottom wall 32 of a head plate, and it is being fixed. The liquid crystal panel units 50R, 50G, and 50B of the same structure are attached in the side face in Mikata in which it functions as optical plane of incidence among the side faces of the prism composition object 22, respectively. Liquid crystal panels 40R, 40G, and 40B are held at each liquid crystal panel units 50R, 50G, and 50B, respectively.

[0044] (Attaching structure of a liquid crystal panel) Each component part of liquid crystal panel unit 50R with which liquid crystal panel 40R is held among the liquid crystal panel units 50R, 50G, and 50B is disassembled into drawing 5, and it is shown. Liquid crystal panel 40R is attached in the prism composition object 22 with reference to this drawing, and the attaching structure of a slack sake is explained.

[0045] As shown in drawing 5, liquid crystal panel unit 50R was equipped with the panel frame board 51 holding liquid crystal panel 40R, and this panel frame 51 is equipped with the 1st frame board 52 and 2nd frame board 53. It is held where liquid crystal panel 40R is put among these frame boards 52 and 53.

[0046] Liquid crystal panel unit 50R equips optical plane-of-incidence 22R of the prism composition object 22 with the fixed frame plate 54 by which adhesion immobilization is carried out further. The panel frame board 51 is fixed to this fixed frame plate 54 side in the removable condition through the middle frame board 55.

[0047] The structure of each part is explained to a detail. First, if the panel frame board 51 is explained, while the 1st frame board 52 is equipped with rectangle opening 52a for optical passage, perimeter wall 52b of fixed thickness is formed in 4 rounds. Rectangle opening 53a for optical passage is formed also in the 2nd frame board 53. This 2nd frame board 53 serves as magnitude which fits in inside perimeter wall 52b of the 1st frame board 52. Moreover, engagement projection 53c is formed in the center of the edge of right and left of the 2nd frame board 53. Engagement slot 52c into which this engagement projection 53c fits is formed in the center of the lateral surface of perimeter wall 52b of right and left of the 1st frame board 53. Therefore, where liquid crystal panel 40R is inserted between the 1st and 2nd frame boards 52 and 53, it piles up mutually, and if those engagement projection 53c is inserted in corresponding engagement slot 52c, the panel frame 51 held where liquid crystal panel 40R is put among these frame boards 52 and 53 is constituted.

[0048] The middle frame board 55 is almost the same as the 1st frame board 52 of the panel frame board 51, or is the rectangle frame formed somewhat more greatly than this, and is equipped with rectangle opening 55a for optical passage. 55d of engagement protruding pieces prolonged perpendicularly is formed in the four corners of that rectangle opening 55a from the frame board front face at this middle frame board 55. On the other hand, 52d of engagement holes in which a plug is possible is formed in the location corresponding to 55d of each engagement protruding piece in these at the 1st frame board 52 side of the panel frame board 51. Therefore, if engagement protruding piece 55b of the middle frame board 55 is doubled and it lays on top of 52d of each engagement hole of the panel frame board 51 mutually, a condition with possible eye tacking 55d of each engagement protruding piece was inserted in 52d of each engagement hole will be formed.

[0049] On the other hand, the fixed frame plate 54 is also a frame board of the rectangle in which rectangle opening 54a for optical passage was formed. The rear face of this fixed frame plate 54 is fixed to optical plane-of-incidence 22R of the prism composition object 22 by adhesives. It ****s in the corner of right and left of this fixed frame plate 54 bottom, and hole 54c is formed. It ****s also to the middle frame board 55 corresponding to such screw-thread hole 54c, and hole 55c is formed.

[0050] Moreover, ejector frame 54b projected towards the middle frame board 55 side is formed in the drag flask part of the fixed frame plate 54. Ejector frame 55b of a configuration into which this ejector frame 54b fits from a rear-face side

is formed in the drag flask part of the middle frame board 55. The panel frame board 51 is held in the condition of having run aground on these ejector frames 54b and 55b. Moreover, it ****s to two right and left, and Holes 54e and 55e are formed in these ejector frames 54b and 55b.

[0051] Thus, it ****s in the location corresponding to mutual, Holes 54c and 54e, and 55c and 55e are formed in the fixed frame plate 55 and the middle frame board 54, and conclusion immobilization of these is carried out by four flat countersunk head screws 56 (one is shown in drawing.) thrust into these screw-thread holes. That is, to the fixed frame plate 54 currently stuck on the prism composition object 22, the middle frame board 55 ****s and a stop is carried out.

[0052] Furthermore, liquid crystal panel unit 50R is equipped with four wedges 57 as a positioning means. Only one only of pieces [them] is shown in drawing 5 . Wedge slideway 52e which inclined plane 57a of this wedge 57 contacts is formed in the part of the perimeter wall of right and left of the 1st frame board 52 of the panel frame board 51. After tacking carrying out of the panel frame board 51 to the middle frame board 55, four wedges 57 are driven into right and left of the 1st frame board 52, the amount of pushing of these wedges 57 is adjusted, and liquid crystal panel 40R is positioned.

[0053] Liquid crystal panel unit 50R of this configuration is attached in optical plane-of-incidence 22R of the prism composition object 22 in the following procedures. First, the panel frame board 51 by which liquid crystal panel 40R was held is prepared. Next, the fixed frame plate 54 is positioned to field 22R of the prism composition object 22, and adhesion immobilization is carried out. Ultraviolet curing mold adhesives etc. can be used as adhesives. Next, the middle frame board 55 is positioned on the front face of the fixed frame plate 54 which carried out adhesion immobilization, and the stop of the middle frame board 55 concerned is ****ed and carried out to it with four screw threads 56. After an appropriate time, the panel frame board 51 by which liquid crystal panel 40R is held is positioned to the middle frame board 55, and carries out [tacking] there. That is, 55d of engagement protruding pieces of the middle frame board 55 is made in agreement with 52d of engagement holes of the panel frame board 51, and the panel frame board 51 is turned and stuffed into the middle frame board 55 in this condition. In addition, before carrying out adhesion immobilization of the fixed frame plate 54 at the prism composition object 22, if the fixed frame plate 54 and the middle frame board 55 are ****ed and it unifies beforehand by 56, it will become easy to take out location precision.

[0054] After this, liquid crystal panel 40R is positioned to field 22R of the prism composition object 22 using the wedge 57 as a positioning means. That is, four wedges 57 are inserted along with wedge slideway 52e formed in the 1st frame board 52 between the panel frame board 51 by which it is tacking carried out, and the middle frame board 55. And alignment adjustment and focal adjustment of liquid crystal panel 40R are performed by adjusting the amount of plugs of each wedge 57.

[0055] In the place whose positioning was completed, adhesion immobilization of these wedges 57 is carried out at the panel frame board 51 and the middle frame board 55 which are a member for positioning using adhesives. In this case, the adhesives of an ultraviolet curing mold can be used also as adhesives to be used.

[0056] Here, positioning of the above-mentioned wedge 57 and the adhesion fixed activity of a wedge 57 are explained in more detail according to process sequence.

[0057] First, the focal field of liquid crystal panel 40G is doubled using the adjusting device of dedication in the focal side of the projection lens 6. In this condition, as above-mentioned, the adhesives of an ultraviolet curing mold are poured into the clearance which goes into 52d of engagement holes of the light valve frame board 51, and is formed, 55d of engagement protruding pieces of a middle plate 55 makes it harden, and they carry out temporary immobilization by UV irradiation. Next, by wedge slideway 52e prepared in the middle frame board 55 and the 1st frame board 52, ultraviolet rays are irradiated, ultraviolet curing mold adhesives are pasted from the exposure end face of a wedge 57, and this immobilization is performed. Focal adjustment of liquid crystal panels 40R and 40B and mutual pixel doubling adjustment are similarly carried out on the basis of liquid crystal panel 40G arranged in the center of liquid crystal panels 40G, 40R, and 40B, and temporary immobilization and this immobilization are performed.

[0058] In addition, since a temporary fixed activity is done by setting in an adjusting device where the prism composition object 22 and the projection lens 6 are attached in the head plate 30, the optimum coordination of it doubled with the property of components each becomes possible. Moreover, chucking to the adjusting device of the light valve frame board 51 is carrying out on the basis of the appearance of 1st frame board 52a.

[0059] Since the liquid crystal panel units 50G and 50B holding liquid crystal panels 40G and 40B other than liquid crystal panel 40R are also the same structures, the explanation is omitted.

[0060] Thus, the condition of the prism composition object 22 of having attached the 3rd page of the liquid crystal panel units 50R, 50G, and 50B in 22R, 22B, and 22G is in the condition shown in drawing 4 . In addition, in this drawing 4 , the members prolonged towards the upper part from each liquid crystal panel units 50R, 50G, and 50B are the flexible cables 41R, 41G, and 41B for wiring.

[0061] According to liquid crystal panel unit 50R constituted as mentioned above, the following effectiveness is acquired.

[0062] Liquid crystal panel 40R has the part of the four peripheries in the condition of having been covered and protected by the rectangular panel frame board 51 the 1st. Therefore, it is not necessary to touch liquid crystal panel 40R directly, and to perform anchoring by the side of the prism composition object 22. For this reason, it can prevent that liquid crystal panel 40R carries out in other parts etc., and damages or suffers a loss. moreover, the perimeter of liquid crystal panel 40R -- a frame board 51 -- **** -- it is covered and outdoor daylight can be intercepted. Therefore, outdoor daylight invades and malfunction does not occur in a liquid crystal panel 40.

[0063] It ****s to field 22R of the prism composition object 22 through the middle frame board 55, and the stop of the panel frame board 51 which held liquid crystal panel 40R to the 2nd is carried out, and it is removable. When it follows, for example, a defect occurs in liquid crystal panel 40R, the easy activity of removing **** 56 can perform the exchange. Since adhesion immobilization of the liquid crystal panel 40R is not directly carried out to the prism composition object 22, moreover, the components of a large sum can be used without futility at the time of such exchange, without damaging the prism composition object 22 side.

[0064] It can tacking carry out of the panel frame 51 which held liquid crystal panel 40R to the 3rd to the middle frame board 55. After forming this tacking condition, a wedge 57 can be used and positioning with liquid crystal panel 40R and field 22R of the prism composition object 22 can be performed. Thus, since a tacking condition can be formed and positioning using a wedge 57 can be easily performed at another process, it ** to the improvement in the cycle time of a facility. Here, generally as a wedge 57, a glass thing can be used. However, when the 1st frame board 52 is used as resin mold goods, since coefficient of thermal expansion is large compared with glass, that a wedge 57 tends to exfoliate from these frame boards by the difference in thermal expansion, it may become or a wedge 57 may be destroyed by the temperature change. In order to avoid this, it is desirable to use a wedge 57 as resin mold goods, such as acrylic. Moreover, since fabrication is possible by making a wedge 57 into the acrylic quality of the material, as compared with a glass agent, cost reduction can be planned sharply. In addition, by using the ingredient which makes ultraviolet rays penetrate as a material of a wedge 57, as adhesives for carrying out adhesion immobilization of the wedge 57, there are few temperature rises and they can use the short ultraviolet curing mold adhesives of the setting time.

[0065] Moreover, by having formed wedge slideway 52e in the 1st frame board 52, the upper limit sides 52f and 52g are formed in the upper and lower sides, and a wedge 57 is guided by these third page. That is, if this part is filled up with adhesives and a wedge 57 is inserted, a wedge 57 will move to the interior automatically with the surface tension of adhesives, showing around by these third page. Therefore, it becomes strong to the disturbance which encounters within a process, and wearing of a wedge 57 is easy.

[0066] In addition, in this example, although adhesives are used for temporary immobilization of the panel frame board 51 to the middle frame board 55, soldering etc. may instead be used. What is necessary is just to use the thing which stuck the metal member on a part for a joint, or the thing which formed the metallized layer in a part for a joint, when the 1st frame board 52 grade is a product made of resin.

[0067] Next, the 1st above-mentioned frame board 52, the middle frame board 55, and the fixed frame plate 54 can be used as the mold goods of the thermosetting resin which mixed glass fiber or a calcium carbonate. If such a resin material is used, the coefficient of thermal expansion will become close to glass compared with a common resin material. For this reason, the pixel gap which originated in heat deformation in the condition of sticking on the prism composition object 22 is avoidable.

[0068] As the fixed frame plate 54 was mentioned above as adhesives for carrying out adhesion immobilization to the prism composition object 22 here, ultraviolet curing mold adhesives can be used, but in order to raise an adhesive property, it is desirable to apply a surface treatment ingredient. That is, in the prism composition object 22, as mentioned above, plane-of-incidence 22R of the red flux of light and plane-of-incidence 22B of a blue glow bundle confront each other. Since wavelength is short, the part may penetrate the reflective film of the prism composition object 22, and a blue glow bundle may result in plane-of-incidence 22R of the red flux of light of the opposite side. Malfunction will be caused if such a backlight carries out incidence to liquid crystal panel 40R. In order to avoid this, generally, a filter is attached in plane-of-incidence 22R of the red flux of light, and such a backlight is intercepted.

[0069] Although it is because the effect by the backlight of a blue glow bundle is the largest, when the effect by the backlight of other flux of lights is large, this limitation does not attach a filter only in plane-of-incidence 22R of the red flux of light. A filter may be prepared in other fields or a filter may be prepared in two or more fields.

[0070] However, when such a filter exists, the ultraviolet rays at the time of adhesion immobilization are interrupted by it, and there is a possibility that a part with UV irradiation insufficient [the ultraviolet curing mold adhesives for carrying out adhesion immobilization] may generate the fixed frame plate 54 in the plane of incidence 22R, 22G, and

22B of the prism composition object 22. In order to avoid this evil and to carry out adhesion immobilization of the fixed frame plate 54 certainly at plane-of-incidence 22R, it is desirable to apply a surface treatment ingredient to these adhesion sides and to use aversion type adhesives together as mentioned above. Of course, same processing may be performed in the plane of incidence in which such a filter does not exist.

[0071] In addition, as adhesives, although use of ultraviolet curing mold adhesives was explained, adhesives other than this may be used. For example, if hot melt type adhesives are used and it is made to perform adhesion immobilization of the fixed frame plate 54, and adhesion immobilization of a wedge 77, it is not necessary to take into consideration a problem with the above-mentioned filter.

[0072] (The 1st modification of liquid crystal panel unit 50R) What is necessary is just to omit the tacking device formed between the panel frame 51 and the middle frame board 55, as shown in drawing 6 when it is not necessary to tacking carry out of the panel frame 51 to the middle frame board 55. Namely, what is necessary is just to omit 52d of engagement holes formed in the panel frame board 51 side, and 55d of engagement protruding pieces formed in the middle frame board 55 side. In this case, the panel frame 51 is fixed to the middle frame 55 only by the wedge 57.

[0073] When liquid crystal panel unit 500R of a configuration of being shown in drawing 6 is used, while being able to acquire the 1st and 2nd above-mentioned effectiveness acquired by liquid crystal panel unit 50R, it becomes effective in miniaturizing the prism unit 20.

[0074] (The 2nd modification of liquid crystal panel unit 50R) It is shown where liquid crystal panel unit 70R concerning the 2nd modification of liquid crystal panel unit 50R is decomposed into drawing 7. In addition, the same sign is given to the part corresponding to liquid crystal panel unit 50R shown in drawing 5, and those explanation is omitted.

[0075] As shown in drawing 7, liquid crystal panel unit 70R is equipped with the panel frame board 71 holding liquid crystal panel 40R. This panel frame board 71 is equipped with the 1st and 2nd frame boards 72 and 73 as well as the panel frame board 51 of liquid crystal panel unit 50R, and has the structure where liquid crystal panel 40R was inserted and held among these frame boards. Only the 1st frame board 72 is expressed in drawing, and the condition that the 2nd frame board 73 and liquid crystal panel 40R attached in the side, and were already fixed to the 1st frame board 72 is shown. Liquid crystal panel unit 70R equips optical plane-of-incidence 22R of the prism composition object 22 with the fixed frame plate 74 by which adhesion immobilization is carried out further. The panel frame board 71 is fixed to this fixed frame plate 74 in the removable condition through the middle frame board 75.

[0076] The panel frame board 71 is fundamentally the same as the panel frame board 51 of liquid crystal panel unit 50R mentioned above. While the 1st frame board 72 is equipped with rectangle opening 72a for optical passage, perimeter wall 72b of fixed thickness is formed in 4 rounds. Rectangle opening for optical passage (not shown) is formed also in the 2nd frame board 73. This 2nd frame board 73 serves as magnitude which fits in exactly inside perimeter wall 72b of the 1st frame board 72. Therefore, where liquid crystal panel 40R is inserted between the 1st and 2nd frame boards 72 and 73, if the 2nd frame board 73 side is inserted in the 1st frame board 72 side, the panel frame 71 held where liquid crystal panel 40R is put among these frame boards 72 and 73 is constituted.

[0077] Here, the 1st frame board 72 and the 2nd frame board 73 insert in, and, fundamentally, doubling structure is the same as that of the 1st and 2nd frame boards 52 and 53 which constitute the panel frame board 51 shown in drawing 5. However, in this example, it has become with the configuration that the engagement slot where a hook and the hook concerned are engaged was formed in the location of the upper and lower sides which sandwich guide rail 72 e-g of the 1st frame board 72. Illustration of these parts is omitted.

[0078] Next, the middle frame board 75 is the rectangle frame of the almost same magnitude as the 1st frame board 72 of the panel frame board 71, and is equipped with rectangle opening 75a for optical passage. 75d of engagement protruding pieces prolonged perpendicularly is formed in the four corners of that rectangle opening 75a from the frame board front face at this middle frame board 75. On the other hand, 72d of engagement holes in which a plug is possible is formed in the location corresponding to 75d of each engagement protruding piece in these at the 1st frame board 72 side of the panel frame board 71. Therefore, if engagement protruding piece 75b of the middle frame board 75 is doubled and it lays on top of 72d of each engagement hole of the panel frame board 71 mutually, the tacking condition that 75d of each engagement protruding piece was inserted in 72d of each engagement hole will be formed.

[0079] On the other hand, the fixed frame plate 74 is also a frame board of the rectangle in which rectangle opening 74a for optical passage was formed. the rear face of this fixed frame plate 74 -- optical plane-of-incidence 22R of the prism composition object 22 -- adhesives -- **** -- it is fixed. **** hole 74c is formed in the mid gear of the longitudinal direction of both the corners of the cope box part of this fixed frame plate 74, and the drag flask part of the fixed frame plate 74. It ****s also to the middle frame board 75 corresponding to these three screw-threads hole 74c, and hole 75c is formed. The middle frame board 75 is fixed to the corresponding **** holes 74c and 75c to the fixed frame plate 74 by

inserting the flat countersunk head screw 76 for conclusion, respectively. In addition, in this example, the middle frame board 75 is being fixed to the fixed frame 74 with three screw threads 76. The number of a screw thread may be four like [in the case of the example shown in drawing 5], and may be more than it. Generally, the routing of **** conclusion decreases, so that there are few numbers.

[0080] Here, engagement projection 74b is formed in right-and-left both the corners of the drag flask part of the fixed frame plate 74, and engagement hole 75b is formed in right-and-left both the corners of the drag flask part of the middle frame board 75 corresponding to these two engagement projection 74b. Therefore, if it faces fixing according to **** 76, engagement hole 75b of the middle frame board 75 is doubled to engagement projection 74b of the fixed frame plate 74 and the middle frame board 75 is stuffed into the fixed frame plate 74 side, it can tacking do of the middle frame board 75 to the fixed frame plate 74. If it does in this way, the positioning accuracy of a mutual frame board can be raised further.

[0081] It has the positioning means for liquid crystal panel unit 70R of this example to also position the panel frame board 71 to the middle frame board 75 fixed to the fixed frame plate 74. This positioning means is equipped with two wedges 77. Wedge slideway 72 e-g which inclined plane 77a of this wedge 77 contacts is formed in the mid gear of the vertical direction of the right-and-left both-sides side of perimeter wall 72a of the 1st frame board 72 of the panel frame board 71. When it carries out [tacking] of the panel frame board 71 to the middle frame board 75, a wedge plug slot is constituted between parts for wedge slideway 72e of the 1st frame board 72, and the frame part of the middle frame board 75 which stand face to face against this. Therefore, if two wedges 77 are driven into right and left of the 1st frame board 72 and the amount of pushing of these wedges 77 is adjusted after tacking carrying out of the panel frame board 71 to the middle frame board 75, liquid crystal panel 40R can be positioned. In addition, since the process which constitutes the prism unit 20 is the same as that of the above-mentioned, the explanation is omitted.

[0082] Also by liquid crystal panel unit 70R constituted as mentioned above, the same effectiveness as the case in the liquid crystal panel unit 50 shown in drawing 5 can be acquired.

[0083] Moreover, unlike the case where it is shown in drawing 5 and drawing 6, in this example, the thing of a flat configuration is used as the fixed frame plate 74 and a middle frame board 75. As explained with reference to drawing 2 (B), fan 15B is arranged under the prism composition object 22, and a cooling wind flows from the bottom to the upper part. In order for turbulence not to be possible for this flow, it is desirable to arrange a straightening vane in the upper part location of fan 15B. Since the thing [flat / as the fixed frame plate 74 and a middle frame board 75] is used, it becomes possible to extend the fitting location of a straightening vane to directly under [of liquid crystal panel unit 70R], therefore a cooling wind can be effectively passed upwards from the bottom. Moreover, since the configuration of these frame boards is simple, there is also an advantage that components processing is easy and components precision's improves.

[0084] In addition, in the liquid crystal panel unit 70, while using two wedges 77 for positioning, they are attached in the mid gear of the vertical direction of the right-and-left both sides in the 1st frame board 72 and middle frame board 75, and adhesion immobilization is carried out. If the adhesion fixed position of a wedge 77 is not suitable, it originates in heat deformation of the 1st frame board 72, the middle frame board 75, or a wedge 77, and there is a possibility that superfluous stress concentration may occur in each part material. Moreover, a possibility that a wedge 77 may exfoliate from the 1st frame board 72 or middle frame board 75 is also in eye others. However, as mentioned above, adhesion immobilization of the wedge 77 has been carried out at the mid gear on either side, and the 1st frame board 72 and middle frame board 75 have the free heat deformation to the vertical direction focusing on this part. Therefore, since the restricted degree of heat deformation of these frame boards is low, evils, such as exfoliation of stress concentration [**** / un-] and a wedge, are avoidable.

[0085] Furthermore, the wedge 77 of this example has formed two foramen-cecum-ossis-forntalis 77c in the tooth-back 77b so that drawing 7 may show. Such foramen-cecum-ossis-forntalis 77c functions as the engagement section for chucking, when carrying out chucking of the wedge 77 and dealing with it using a fixture. If such foramen-cecum-ossis-forntalis 77c is formed, the chucking can be simplified, therefore the handling actuation will become easy.

[0086] In addition, in this example, foramen-cecum-ossis-forntalis 77c for the engagement at the time of chucking is formed in the tooth back of a wedge 77. The engagement section for chucking may be formed in members other than this. For example, the engagement sections for chucking, such as foramen cecum ossis forntalis, may be formed in the external surface of perimeter wall 72a of the panel frame board 71.

[0087] (Gestalt of another operation of a liquid crystal panel unit) The gestalt of another operation of a liquid crystal panel unit is shown in drawing 8. Liquid crystal panel unit 60R shown in this drawing is also equipped with the panel frame board 61 holding liquid crystal panel 40R, and the fixed frame plate 64 by which adhesion immobilization is carried out at field 22R of the prism composition object 22. However, the part corresponding to the middle frame boards

55 and 75 in the above-mentioned example is not equipped, but the stop of the panel frame 61 is directly ****ed and carried out to the fixed frame plate 64 side. If it explains to a detail, the configuration of the panel frame board 61 will be the same as the configuration of the panel frame board 51 of drawing 5 mentioned above, will be equipped with the 1st frame board 62 and 2nd frame board 63, and where liquid crystal panel 40R is put among these, it will be held. In order to hold these 1st and 2nd frame boards 62 and 63 in the engagement condition, engagement hook 63c and engagement pawl 62c are formed. Moreover, the rectangle openings 62a and 63a for optical passage are formed in these 1st and 2nd frame boards 62 and 63.

[0088] On the other hand, the fixed frame plate 64 is carrying out the configuration by which *****, i.e., perimeter wall 64e of fixed width of face, was formed in 4 rounds of a rectangle frame part. To the inside of perimeter wall 64e, fitting is possible for the panel frame board 61. Moreover, 64f of **** holes is formed in the four corners by the side of the inner circumference of perimeter wall 64e. It ****s also in the four corners of the 1st frame board 62 of the panel frame board 61 corresponding to 64f of these screw-thread holes, and 62f of holes is formed. By ****ing to these and thrusting 66, stop immobilization of the panel frame board 61 is ****ed and carried out at the fixed frame plate 64 side.

[0089] On the other hand, 64g of wedge slideways is formed in two upper and lower sides of the side face of one of these at perimeter wall 64e of the fixed frame plate 64. 64g of wedge slideways is formed in the side face of another side at one place of the center of the vertical direction.

[0090] Liquid crystal panel unit 60R of this structure ****s the panel frame board 61, and is constituted by ****ing and carrying out a stop to the fixed frame plate 64 side by 66. A location is decided to be after an appropriate time to field 22R of the prism composition object 22. In this condition, it inserts into 64g of wedge slideways which had three wedges 67 formed, and positioning is made to hold with the surface tension of the adhesives of the ultraviolet curing mold already applied to the plane of composition of a wedge, so that a clearance may become zero. After positioning of a wedge 67 is made by this, ultraviolet rays are irradiated from the exposure end face of a wedge 67, adhesives are stiffened, and adhesion immobilization is carried out.

[0091] In addition, a wedge 67 is good for the mid gear of the both-sides side of perimeter wall 64e of a fixed frame plate also as structure which it arranges one place at a time respectively. When the fixed frame plate 64 is enlarged, effect of the expansion and contraction accompanying a temperature change can be made into min, and it ** to the improvement in dependability.

[0092] Liquid crystal panel 40R is covered with and protected by the frame 61 also in liquid crystal panel unit 60R of this configuration. Moreover, the stop of the frame 61 holding liquid crystal panel 40R is ****ed and carried out to the fixed frame plate 64 side. Therefore, it is in the condition that liquid crystal panel 40R was protected, and outdoor daylight does not invade. Furthermore, at the time of exchange of a liquid crystal panel, since it is good only by removing ****, an easy activity can perform. Moreover, the field of a prism composition object is not damaged at the time of exchange.

[0093] Moreover, since it consists of a panel frame board 61 and a fixed frame plate 64, on the whole, liquid crystal panel unit 60R of this example can be made lightweight, and can be constituted thinly. When it miniaturizes further liquid crystal panel 60R, and G and B especially, and a thick liquid crystal panel unit is stuck on the third page, the part of the optical system which both liquid crystal panel units interfere in the part of an angle, and includes the prism composition object 22 may be unable to be miniaturized, but since the small thin liquid crystal panel unit 60 can be constituted from this example, it is easy to realize the miniaturization of the part of optical system including the prism composition object 22.

[0094] Furthermore, it becomes possible about the fixed frame plate 64 and the 1st frame board 62 to use resin material, and the goods which the bond strength of lightweight-izing and the prism support plate 33, and the prism unit 20 is raised, and have shock resistance are made realizable.

[0095] In liquid crystal panel unit 60R of this example, at the time of exchange of the liquid crystal panel 40R, since what is necessary is to remove only the panel frame board 61 and just to exchange, an activity is easy further again. Especially, in anchoring of the new panel frame board 61, if this panel frame board 61 is made direct attachment at the fixed frame plate 64 side, that focal location will be determined. Since focal tuning will become unnecessary at the time of panel frame board anchoring if each part article is manufactured as the error of the focal location at the time of this anchoring turns into an error in focal permission depth, anchoring becomes easy.

[0096] In addition, the method which carries out adhesion immobilization of several places of the appearance of the 1st frame board 62 at the fixed frame plate 64 may be used after exchange, without using **** 66.

[0097] On the other hand, as shown in drawing 9, it is possible to prepare 62g of blind holes in the location of two places of the direction of the diagonal line of the four corners of the 1st fixed frame plate 62, to carry out chucking of the 1st fixed frame plate 62 concerned with the equipment for adjustment using this, and to position to the field of the

prism composition object 22. What is necessary is just to cancel chucking by the equipment for adjustment, after the adhesives for carrying out adhesion immobilization of the 1st fixed frame plate 62 as mentioned above harden completely. The positioning will become easy if such a blind hole for chucking is prepared.

[0098] In addition, 62g of blind holes for chucking may be prepared in the periphery part of the 1st frame board 62 in the shape of a notch, and they may constitute the engagement section as a chucking part further into the appearance part of the part which does not interfere in side-attachment-wall 64e of the fixed frame plate 64.

[0099]

[Effect of the Invention] As explained above, since the amount of gaps of pixel doubling is held down to a photosynthesis means since the positioning immobilization of the light valve can be carried out certainly, and focal adjustment can be correctly doubled with it, with the projection mold indicating equipment of this invention, highly minute-ization is enabled more easily. In addition, though considered as the structure in which light valve exchange is possible, since a photosynthesis means can be miniaturized, while ******(ing) to small and lightweight-ization of goods, commercial production which raised dependability strong against disturbance-proof is enabled. By arranging the installation part with a light valve, a middle frame board, or a fixed frame plate in a vertical wall, the aeration part of the cooling style can be prepared and the cooling engine performance can be secured.

[0100] In addition, he is trying to hold the light valve arranged at the optical plane of incidence of a photosynthesis means in a manufacture side, where the perimeter is protected by the light valve frame board. Moreover, he is trying to attach in the optical plane of incidence of photosynthesis ********* the light valve frame board by which the light valve was held in the removable condition to the fixed frame plate which carried out adhesion immobilization. Therefore, according to this invention, since the perimeter of a light valve is covered and protected by the light valve frame board, there is no fear of it being damaged at the time of the handling of a light valve. Moreover, outdoor daylight invades from a perimeter and malfunction does not occur in a light valve. Furthermore, when fault occurs in a light valve, since only light valves can be exchanged without hurting one's front face of a photosynthesis means, it is at an economic target. The same manufacturing installation can perform exchange of a light valve simply and correctly further again.

[Translation done.]

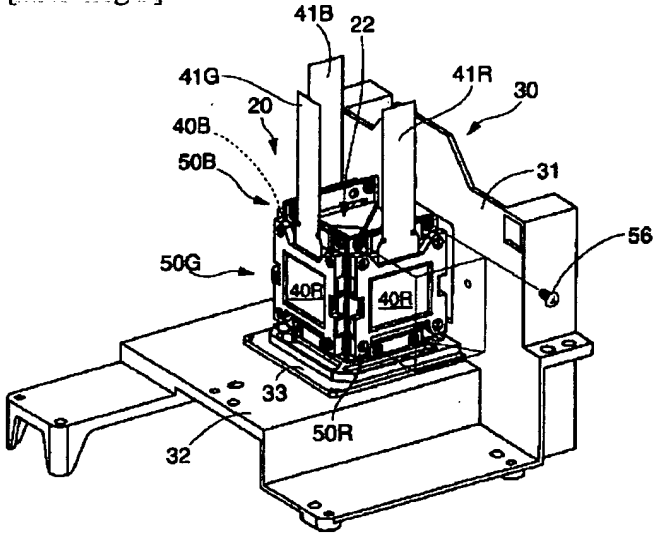
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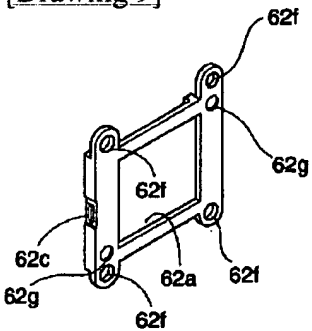
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DRAWINGS

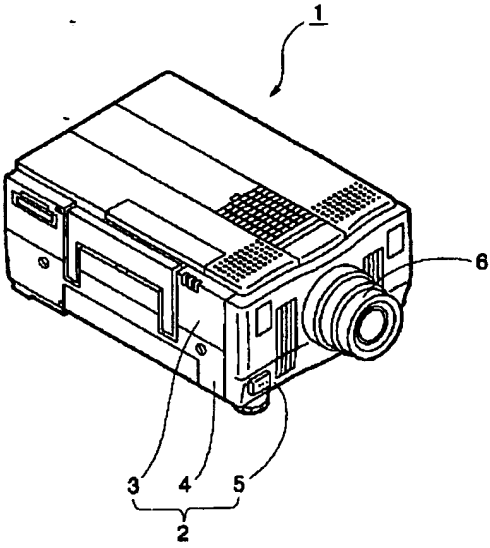
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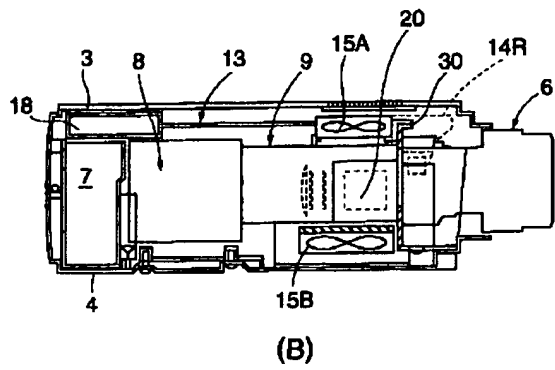
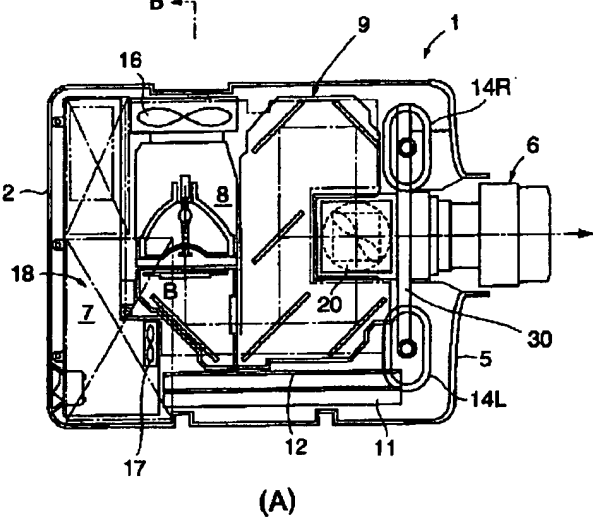
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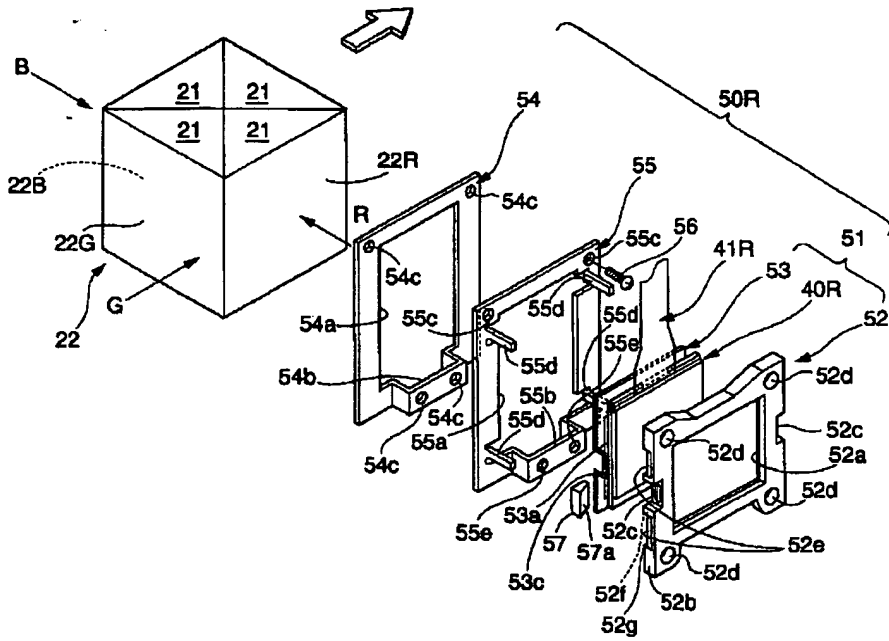
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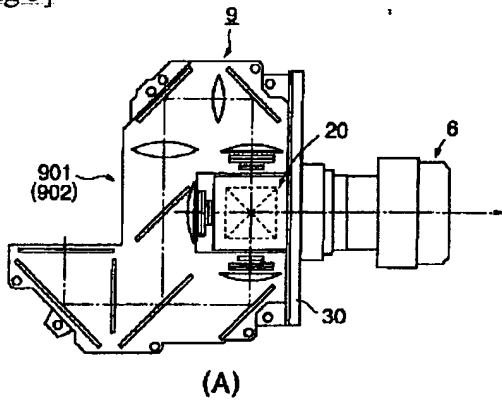
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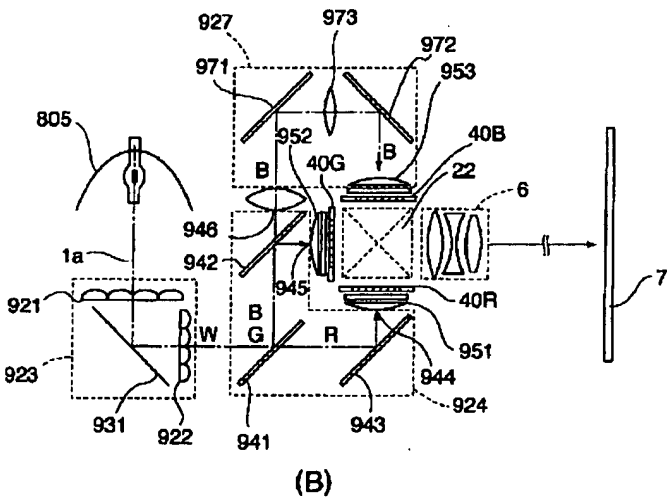
[Drawing 5]



[Drawing 3]

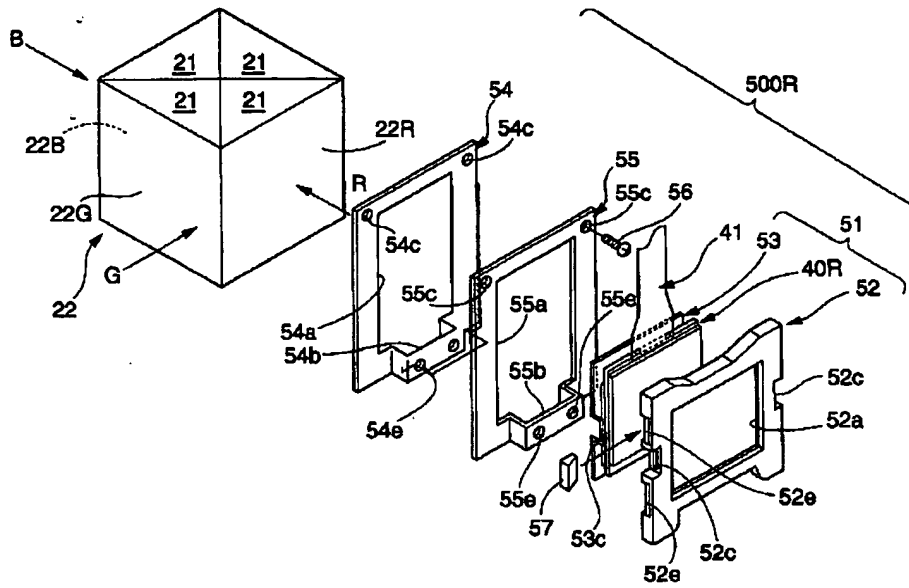


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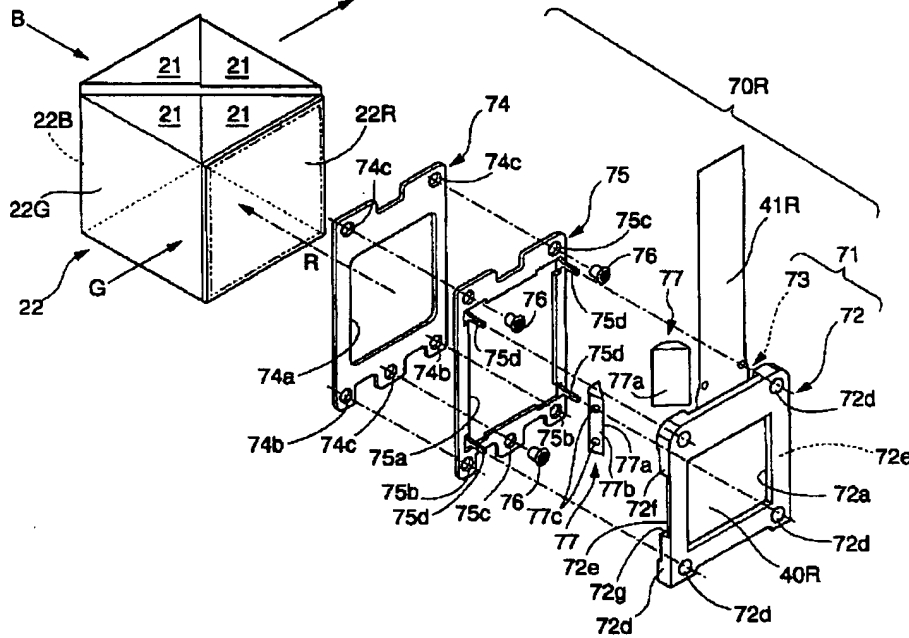


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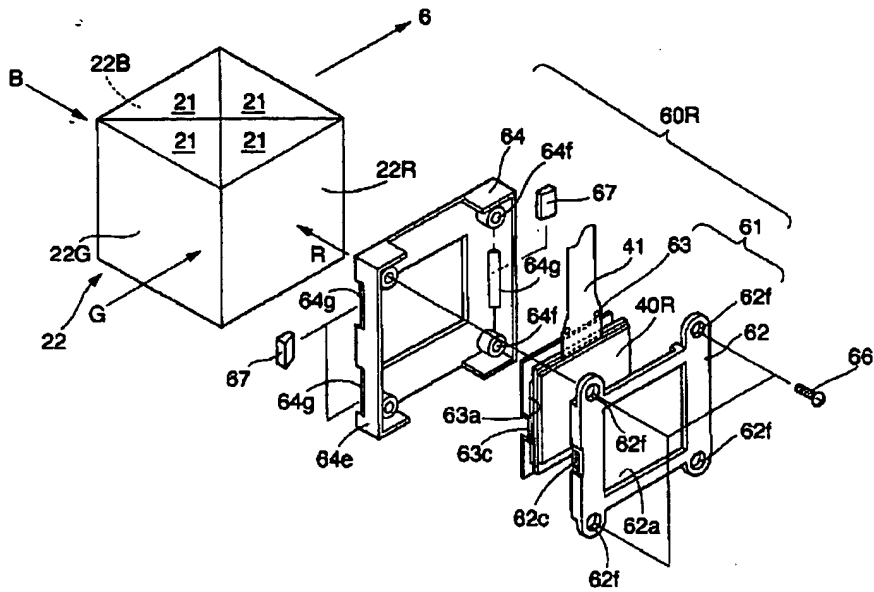
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Translation done.]

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CORRECTION OR AMENDMENT

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[Document to be Amended] Specification

[Item(s) to be Amended] Claim

[Method of Amendment] Modification

[Proposed Amendment]

[Claim(s)]

[Claim 1] It is the projection mold display which decomposes the flux of light from the light source into the flux of light of two or more colors, each colored light bundle is made to correspond to image information through a panel, modulates it, re-compounds the modulation flux of light of each color after becoming irregular with a photosynthesis means, and carries out expansion projection through a projection means,

The anchoring device of said panel,

The fixed frame plate fixed to the optical plane of incidence of said photosynthesis means

The panel frame board holding said panel,

A fixed means to fix said panel frame board to said fixed frame plate removable,

A positioning means to position said panel

The projection mold display characterized by having.

[Claim 2] It is the projection mold display which decomposes the flux of light from the light source into the flux of light of two or more colors, each colored light bundle is made to correspond to image information through a panel, modulates it, re-compounds the modulation flux of light of each color after becoming irregular with a photosynthesis means, and carries out expansion projection through a projection means,

The anchoring device of said panel,

The fixed frame plate fixed to the optical plane of incidence of said photosynthesis means

The panel frame board holding said panel,

The middle frame board arranged between said panel frame boards and said fixed frame plates,

A fixed means to fix said middle frame board to said fixed frame plate removable,

A positioning means to position said panel,

The projection mold display by which it is characterized.

[Claim 3] In claim 2,

The projection mold display characterized by having the tacking means for tacking carrying out of said middle frame board and said panel frame board.

[Claim 4] In claim 3,

Said tacking means is a projection mold display characterized by engaging the engagement protruding piece formed in either said middle frame board or said panel frame board, and the engagement hole formed in another side.

[Claim 5] In claim 4,

The engagement section of said engagement hole and said engagement protruding piece is a projection mold display characterized by carrying out adhesion immobilization.

[Claim 6] In claims 1-5,

Said positioning means is a projection mold display characterized by including the controller material which adjusts the location of said panel.

[Claim 7] In claim 6,

The projection mold display characterized by forming a controller material guidance means in said panel frame board.

[Claim 8] In claims 6 and 7,

Said controller material is a projection mold display characterized by having at least one engagement section used in case chucking of the controller material concerned is carried out.

[Claim 9] In claims 6-8,

Said controller material is a projection mold display characterized by preparing near the center of a flank said panel frame board or a fixed frame plate counters.

[Claim 10] In claims 1-9,

Either [at least] said panel frame board or said fixed frame plate is the projection mold display characterized by having the perimeter [wrap] wall for 4 rounds of said panel.

[Claim 11] In claims 1-10,

One [at least] frame board of said panel frame board and said fixed frame plate is a projection mold display characterized by having the engagement section for carrying out chucking of the frame board concerned.

[Claim 12] In claims 1-11,

It is the projection mold display which said panel frame board consists of the 1st frame board and 2nd frame board, and is characterized by pinching said panel between said 1st frame board and said 2nd frame board.

[Claim 13] In claims 1-12,

Said panel is a projection mold display characterized by being a liquid crystal light valve.

[Procedure amendment 2]

[Document to be Amended] Specification

[Item(s) to be Amended] 0001

[Method of Amendment] Modification

[Proposed Amendment]

[0001]

[Industrial Application] This invention decomposes the flux of light from the light source into red, blue, and 3 green colored light bundles, each of these colored light bundles are made to correspond to image information through panels, such as a liquid crystal panel, and modulates them, re-compounds the modulation flux of light of each color after becoming irregular with a photosynthesis means, and relates to the projection mold display which carries out expansion projection through a projection means.

[Procedure amendment 3]

[Document to be Amended] Specification

[Item(s) to be Amended] 0002

[Method of Amendment] Modification

[Proposed Amendment]

[0002] This invention relates to the anchoring device of a panel over the prism composition object which constitutes the photosynthesis means in the projection mold display of this format in more detail.

[Procedure amendment 4]

[Document to be Amended] Specification

[Item(s) to be Amended] 0010

[Method of Amendment] Modification

[Proposed Amendment]

[0010]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention decomposes the flux of light from the light source into the flux of light of two or more colors, and make each colored light bundle correspond to image information through a panel, it modulates it, and the modulation flux of light of each color after becoming irregular is re-compounded with a photosynthesis means. In the projection mold display which carries out expansion projection through a projection means, while protecting the perimeter of a panel so that invasion of outdoor daylight, breakage, etc. may not break out, the configuration which does not have to carry out adhesion immobilization of the panel directly to a photosynthesis means is adopted.

[Procedure amendment 5]

[Document to be Amended] Specification

[Item(s) to be Amended] 0011

[Method of Amendment] Modification

[Proposed Amendment]

[0011] That is, this application the 1st invention has adopted the configuration which has the fixed frame plate fixed to the optical plane of incidence of said photosynthesis means, the panel frame board holding said panel, a fixed means to fix said panel frame board to said fixed frame plate removable, and a positioning means to perform positioning of said panel.

[Procedure amendment 6]

[Document to be Amended] Specification

[Item(s) to be Amended] 0012

[Method of Amendment] Modification

[Proposed Amendment]

[0012] Next, in addition to said fixed frame plate and said panel frame board, in this application the 2nd invention, the configuration equipped with the middle frame board arranged among these is adopted. In this case, the configuration which has a fixed means to fix said middle frame board to said fixed frame plate removable is adopted.

[Procedure amendment 7]

[Document to be Amended] Specification

[Item(s) to be Amended] 0013

[Method of Amendment] Modification

[Proposed Amendment]

[0013] In invention of this application 2nd, it is desirable to position said middle frame board by which adopted the configuration with the tacking means for tacking carrying out of said middle frame board and said panel frame board, and it was tacking carried out with the tacking means concerned, and said panel frame board with said positioning means. If it does in this way, since positioning can be performed in the condition of having been tacking carried out, positioning can be performed easily.

[Procedure amendment 8]

[Document to be Amended] Specification

[Item(s) to be Amended] 0014

[Method of Amendment] Modification

[Proposed Amendment]

[0014] Said tacking means can consider the engagement protruding piece formed in the frame board of either said middle frame board and said panel frame board, and the engagement hole formed in the frame board of another side as the engaged configuration. In this case, what is necessary is just to tacking carry out of the engagement section of said

engagement hole and said engagement protruding piece with adhesives.

[Procedure amendment 9]

[Document to be Amended] Specification

[Item(s) to be Amended] 0015

[Method of Amendment] Modification

[Proposed Amendment]

[0015] Said positioning means can be considered as the configuration containing the controller material for adjusting the location of said panel. In this case, it can consider as the configuration which forms a controller material guidance means in said panel frame board.

[Procedure amendment 10]

[Document to be Amended] Specification

[Item(s) to be Amended] 0016

[Method of Amendment] Modification

[Proposed Amendment]

[0016] On the other hand, said controller material can be considered as a configuration equipped with at least one engagement section used in case chucking of the controller material concerned is carried out so that said controller material can be easily dealt with with a fixture etc.

[Procedure amendment 11]

[Document to be Amended] Specification

[Item(s) to be Amended] 0017

[Method of Amendment] Modification

[Proposed Amendment]

[0017] Moreover, said positioning means can be considered as the configuration prepared near the center of a flank said panel frame board or said fixed frame plate counters. If it does in this way, the stress concentration by heat deformation of the member for positioning etc. is avoidable.

[Procedure amendment 12]

[Document to be Amended] Specification

[Item(s) to be Amended] 0018

[Method of Amendment] Modification

[Proposed Amendment]

[0018] Moreover, the configuration in which either [at least] said panel frame board or said fixed frame plate forms a perimeter [wrap] wall for 4 rounds of said panel is used for this invention.

[Procedure amendment 13]

[Document to be Amended] Specification

[Item(s) to be Amended] 0019

[Method of Amendment] Modification

[Proposed Amendment]

[0019] Moreover, one [at least] frame board of said fixed frame plate and said panel frame board can be considered as a configuration equipped with the engagement section for carrying out chucking of the frame board concerned so that this invention can deal with easily said fixed frame plate and said panel frame board with a fixture etc.

[Procedure amendment 14]

[Document to be Amended] Specification

[Item(s) to be Amended] 0020

[Method of Amendment] Modification

[Proposed Amendment]

[0020] Moreover, as for this invention, said panel frame board consists of the 1st frame board and 2nd frame board, and said panel can also adopt the configuration pinched between said 1st frame board and 2nd frame board.

[Procedure amendment 15]

[Document to be Amended] Specification

[Item(s) to be Amended] 0021

[Method of Amendment] Modification

[Proposed Amendment]
 [0021] Moreover, liquid crystal equipment can be used for this invention as said panel.

This invention is weak to static electricity, and, in the case of a lifting or cone liquid crystal equipment, especially effective in malfunction to invasion of outdoor daylight.

[Procedure amendment 16]
 [Document to be Amended] Specification
 [Item(s) to be Amended] 0022
 [Method of Amendment] Modification
 [Proposed Amendment]

[0022] Thus, in the projection mold display of constituted this invention, the panel is held by the panel frame board. Moreover, a fixed frame plate is fixed to the optical plane of incidence of a photosynthesis means, and the panel frame board by which the panel was held is being directly fixed removable through the middle frame board to this fixed frame plate.

[Procedure amendment 17]
 [Document to be Amended] Specification
 [Item(s) to be Amended] 0023
 [Method of Amendment] Modification
 [Proposed Amendment]

[0023] Therefore, when a defect occurs by aging, a panel removes the panel frame board holding a panel from the fixed frame plate currently fixed to the photosynthesis means, and should just attach the panel frame board holding a new panel in a fixed frame plate. Thus, since the panel is not being directly fixed to the photosynthesis means, exchange of a panel can be performed easily and the front face of a photosynthesis means is not damaged at the time of exchange.

[Procedure amendment 18]
 [Document to be Amended] Specification
 [Item(s) to be Amended] 0024
 [Method of Amendment] Modification
 [Proposed Amendment]

[0024] Moreover, with the projection mold display of this invention, since the perimeter is protected by the panel frame board, a panel does not work in the time of anchoring to a photosynthesis means etc., where a panel is touched directly. Therefore, breakage of a panel can be prevented. Moreover, in the condition of being used being included in a projection mold display, since the periphery is covered with the panel frame board, there is also no possibility that outdoor daylight may invade and malfunction may occur.

[Procedure amendment 19]
 [Document to be Amended] Specification
 [Item(s) to be Amended] 0025
 [Method of Amendment] Modification
 [Proposed Amendment]

[0025] Moreover, liquid crystal equipment can be used as the above-mentioned panel. This invention is weak to static electricity, and, in the case of a lifting or cone liquid crystal equipment, especially effective in malfunction to invasion of outdoor daylight.

[Procedure amendment 20]
 [Document to be Amended] Specification
 [Item(s) to be Amended] 0026
 [Method of Amendment] Modification
 [Proposed Amendment]

[0026] Furthermore, as the above-mentioned panel, there are a thing of a light transmission mold and a thing of a light reflex mold. When using the panel of a light reflex mold, it is common to also play a role of an optical separation means by which a photosynthesis means decomposes the flux of light from the light source into the flux of light of two or more colors.

[Procedure amendment 21]
 [Document to be Amended] Specification
 [Item(s) to be Amended] 0027
 [Method of Amendment] Modification
 [Proposed Amendment]

[0027] Although two kinds of tooth-back projection mold displays with which projection is performed from the direction where the front projection mold display with which projection is performed as a projection mold display from the side which observes a projection side and the side which observes a projection side are opposite exist, this invention is applicable to any type. In addition, although a fixed frame plate, a panel frame board, a fixed means, and a positioning

means will be used for the field of a dichroic prism and positioning immobilization of the panel will be carried out when using a dichroic prism as the above-mentioned photosynthesis means, this fixed structure can consider applying solid state image sensors, such as CCD, to the structure which carries out positioning immobilization at color-separation prism in a camera etc.

[Procedure amendment 22]

[Document to be Amended] Specification

[Item(s) to be Amended] 0047

[Method of Amendment] Modification

[Proposed Amendment]

[0047] The structure of each part is explained to a detail. First, if the panel frame board 51 is explained, while the 1st frame board 52 is equipped with rectangle opening 52a for optical passage, perimeter wall 52b of fixed thickness is formed in 4 rounds. Rectangle opening 53a for optical passage is formed also in the 2nd frame board 53. This 2nd frame board 53 serves as magnitude which fits in inside perimeter wall 52b of the 1st frame board 52. Moreover, engagement projection 53c is formed in the center of the edge of right and left of the 2nd frame board 53. Engagement slot 52c into which this engagement projection 53c fits is formed in the center of the lateral surface of perimeter wall 52b of right and left of the 1st frame board 52. Therefore, where liquid crystal panel 40R is inserted between the 1st and 2nd frame boards 52 and 53, it piles up mutually, and if those engagement projection 53c is inserted in corresponding engagement slot 52c, the panel frame 51 held where liquid crystal panel 40R is put among these frame boards 52 and 53 is constituted.

[Procedure amendment 23]

[Document to be Amended] Specification

[Item(s) to be Amended] 0048

[Method of Amendment] Modification

[Proposed Amendment]

[0048] The middle frame board 55 is almost the same as the 1st frame board 52 of the panel frame board 51, or is the rectangle frame formed somewhat more greatly than this, and is equipped with rectangle opening 55a for optical passage. 55d of engagement protruding pieces prolonged perpendicularly is formed in the four corners of that rectangle opening 55a from the frame board front face at this middle frame board 55. On the other hand, 52d of engagement holes in which a plug is possible is formed in the location corresponding to 55d of each engagement protruding piece in these at the 1st frame board 52 side of the panel frame board 51. Therefore, if 55d of engagement protruding pieces of the middle frame board 55 is set and it lays on top of 52d of each engagement hole of the panel frame board 51 mutually, a condition with possible eye tacking 55d of each engagement protruding piece was inserted in 52d of each engagement hole will be formed.

[Procedure amendment 24]

[Document to be Amended] Specification

[Item(s) to be Amended] 0051

[Method of Amendment] Modification

[Proposed Amendment]

[0051] Thus, it ****s in the location corresponding to mutual, Holes 54c and 54e, and 55c and 55e are formed in the fixed frame plate 54 and the middle frame board 55, and conclusion immobilization of these is carried out by four flat countersunk head screws 56 (one is shown in drawing.) thrust into these screw-thread holes. That is, to the fixed frame plate 54 currently stuck on the prism composition object 22, the middle frame board 55 ****s and a stop is carried out.

[Procedure amendment 25]

[Document to be Amended] Specification

[Item(s) to be Amended] 0057

[Method of Amendment] Modification

[Proposed Amendment]

[0057] First, the focal field of liquid crystal panel 40G is doubled using the adjusting device of dedication in the focal side of the projection lens 6. In this condition, as above-mentioned, the adhesives of an ultraviolet curing mold are poured into the clearance which goes into 52d of engagement holes of the panel frame board 51, and is formed, 55d of engagement protruding pieces of the middle frame board 55 makes it harden, and they carry out temporary immobilization by UV irradiation. Next, by wedge slideway 52e prepared in the middle frame board 55 and the 1st frame board 52, ultraviolet rays are irradiated, ultraviolet curing mold adhesives are pasted from the exposure end face of a wedge 57, and this immobilization is performed. Focal adjustment of liquid crystal panels 40R and 40B and mutual

pixel-doubling adjustment are similarly carried out on the basis of liquid crystal panel 40G arranged in the center of liquid crystal panels 40G, 40R, and 40B, and temporary immobilization and this immobilization are performed.

[Procedure amendment 26]

[Document to be Amended] Specification

[Item(s) to be Amended] 0058

[Method of Amendment] Modification

[Proposed Amendment]

[0058] In addition, since a temporary fixed activity is done by setting in an adjusting device where the prism composition object 22 and the projection lens 6 are attached in the head plate 30, the optimum coordination of it doubled with the property of components each becomes possible. Moreover, chucking to the adjusting device of the panel frame board 51 is carrying out on the basis of the appearance of the 1st frame board 52.

[Procedure amendment 27]

[Document to be Amended] Specification

[Item(s) to be Amended] 0062

[Method of Amendment] Modification

[Proposed Amendment]

[0062] Liquid crystal panel 40R has the part of the four peripheries in the condition of having been covered and protected by the rectangular panel frame board 51 the 1st. Therefore, it is not necessary to touch liquid crystal panel 40R directly, and to perform anchoring by the side of the prism composition object 22. For this reason, it can prevent that liquid crystal panel 40R carries out in other parts etc., and damages or suffers a loss. Moreover, the perimeter of liquid crystal panel 40R is covered with the panel frame board 51, and can intercept outdoor daylight. Therefore, outdoor daylight invades and malfunction does not occur in a liquid crystal panel 40.

[Procedure amendment 28]

[Document to be Amended] Specification

[Item(s) to be Amended] 0071

[Method of Amendment] Modification

[Proposed Amendment]

[0071] In addition, as adhesives, although use of ultraviolet curing mold adhesives was explained, adhesives other than this may be used. For example, if hot melt type adhesives are used and it is made to perform adhesion immobilization of the fixed frame plate 54, and adhesion immobilization of a wedge 57, it is not necessary to take into consideration a problem with the above-mentioned filter.

[Procedure amendment 29]

[Document to be Amended] Specification

[Item(s) to be Amended] 0086

[Method of Amendment] Modification

[Proposed Amendment]

[0086] In addition, in this example, foramen-ecum-ossis-forntalis 77c for the engagement at the time of chucking is formed in the tooth back of a wedge 77. The engagement section for chucking may be formed in members other than this. For example, the engagement sections for chucking, such as foramen cecum ossis forntalis, may be formed in the external surface of perimeter wall 72b of the panel frame board 71.

[Procedure amendment 30]

[Document to be Amended] Specification

[Item(s) to be Amended] 0091

[Method of Amendment] Modification

[Proposed Amendment]

[0091] In addition, a wedge 67 is good for the mid gear of the both-sides side of perimeter wall 64e of the fixed frame plate 61 also as structure which it arranges one place at a time respectively. When the fixed frame plate 64 is enlarged, effect of the expansion and contraction accompanying a temperature change can be made into min, and it ** to the improvement in dependability.

[Procedure amendment 31]

[Document to be Amended] Specification

[Item(s) to be Amended] 0092

[Method of Amendment] Modification

[Proposed Amendment]

[0092] Liquid crystal panel 40R is covered with and protected by the panel frame board 61 also in liquid crystal panel unit 60R of this configuration. Moreover, the stop of the panel frame board 61 holding liquid crystal panel 40R is ****ed and carried out to the fixed frame plate 64 side. Therefore, it is in the condition that liquid crystal panel 40R was protected, and outdoor daylight does not invade. Furthermore, at the time of exchange of a liquid crystal panel, since it is good only by removing ****, an easy activity can perform. Moreover, the field of a prism composition object is not damaged at the time of exchange.

[Procedure amendment 32]

[Document to be Amended] Specification

[Item(s) to be Amended] 0097

[Method of Amendment] Modification

[Proposed Amendment]

[0097] On the other hand, as shown in drawing 9, it is possible to prepare 62g of foramen cecum ossis forntalis in the location of two places of the direction of the diagonal line of the four corners of the 1st frame board 62, to carry out chucking of the 1st fixed frame plate 62 concerned with the equipment for adjustment using this, and to position to the field of the prism composition object 22. What is necessary is just to cancel chucking by the equipment for adjustment, after the adhesives for carrying out adhesion immobilization of the 1st frame board 62 as mentioned above harden completely. The positioning will become easy if such foramen cecum ossis forntalis for chucking is prepared.

[Procedure amendment 33]

[Document to be Amended] Specification

[Item(s) to be Amended] 0098

[Method of Amendment] Modification

[Proposed Amendment]

[0098] In addition, 62g of foramen cecum ossis forntalis for chucking may be prepared in the periphery part of the 1st frame board 62 in the shape of a notch, and it may constitute the engagement section as a chucking part further into the appearance part of the part which does not interfere in side-attachment-wall 64e of the fixed frame plate 64.

[Procedure amendment 34]

[Document to be Amended] Specification

[Item(s) to be Amended] 0099

[Method of Amendment] Modification

[Proposed Amendment]

[0099]

[Effect of the Invention] As explained above, since the amount of gaps of pixel doubling is held down to a photosynthesis means since the positioning immobilization of the panel can be carried out certainly, and focal adjustment can be correctly doubled with it, with the projection mold display of this invention, highly minute-ization is enabled more easily. In addition, though considered as the structure in which panel exchange is possible, since a photosynthesis means can be miniaturized, while **(ing) to small and lightweight-ization of goods, commercial production which raised dependability strong against disturbance-proof is enabled. By arranging the installation part with a panel, a middle frame board, or a fixed frame plate in a vertical wall, the aeration part of the cooling style can be prepared and the cooling engine performance can be secured.

[Procedure amendment 35]

[Document to be Amended] Specification

[Item(s) to be Amended] 0100

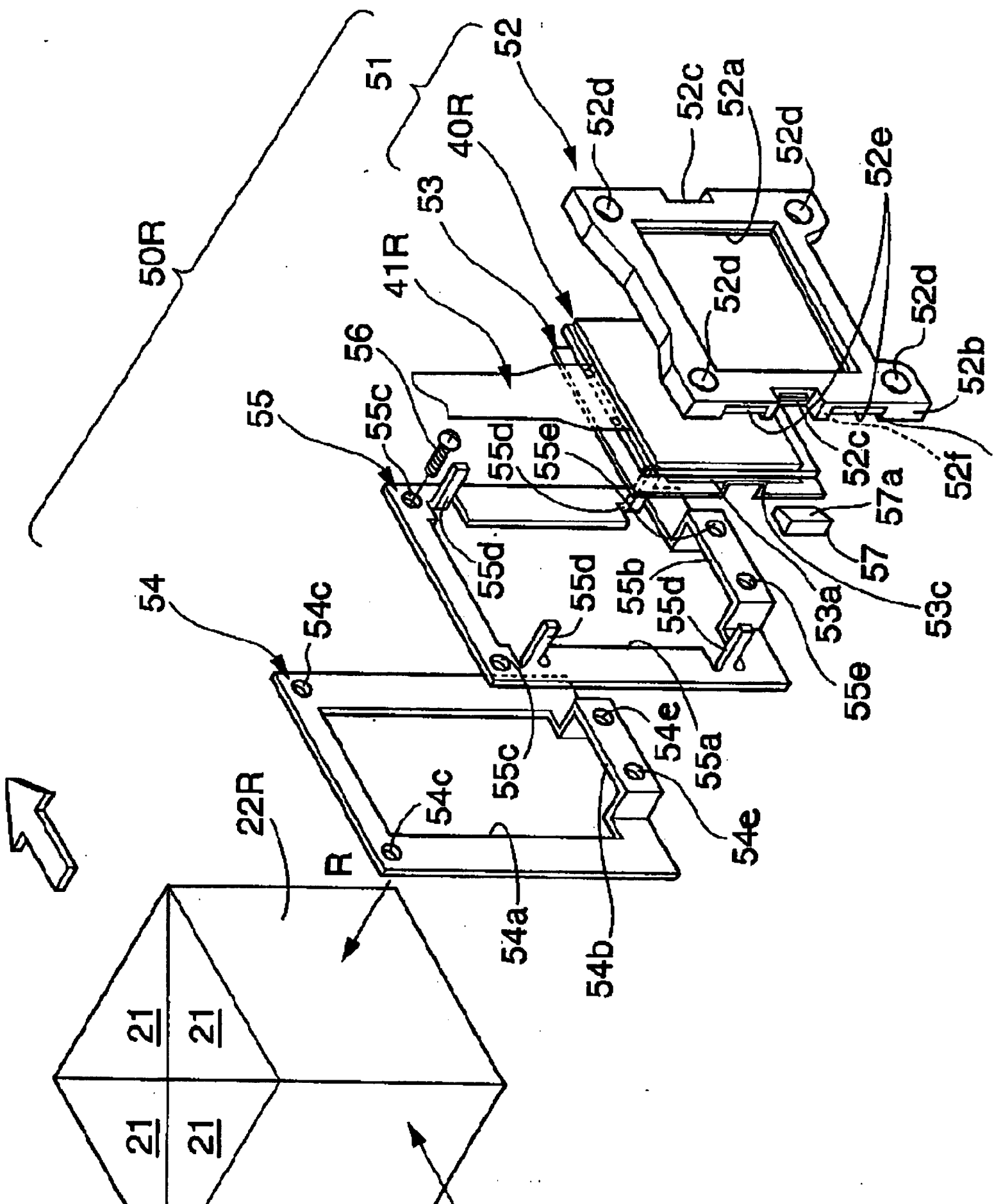
[Method of Amendment] Modification

[Proposed Amendment]

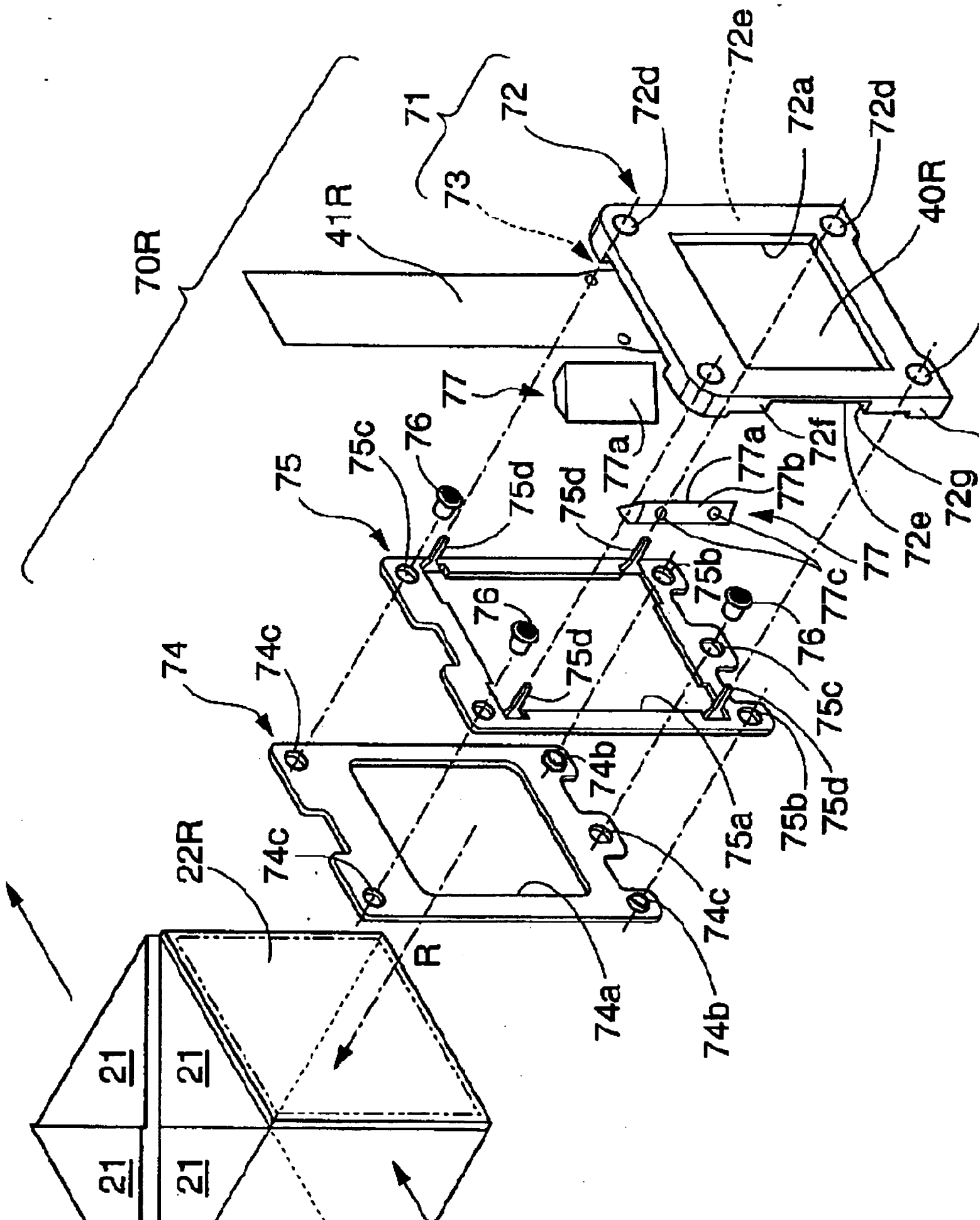
[0100] In addition, he is trying to hold the panel arranged at the optical plane of incidence of a photosynthesis means in a manufacture side, where the perimeter is protected by the panel frame board. Moreover, he is trying to attach in the optical plane of incidence of a photosynthesis means the panel frame board by which the panel was held in the removable condition to the fixed frame plate which carried out adhesion immobilization. Therefore, according to this invention, since the perimeter of a panel is covered and protected by the panel frame board, there is no fear of it being damaged at the time of the handling of a panel. Moreover, outdoor daylight invades from a perimeter and malfunction does not occur on a panel. Furthermore, when fault occurs on a panel, since only panels can be exchanged without hurting one's front face of a photosynthesis means, it is economical. The same manufacturing installation can perform exchange of a panel simply and correctly further again.

[Procedure amendment 36]

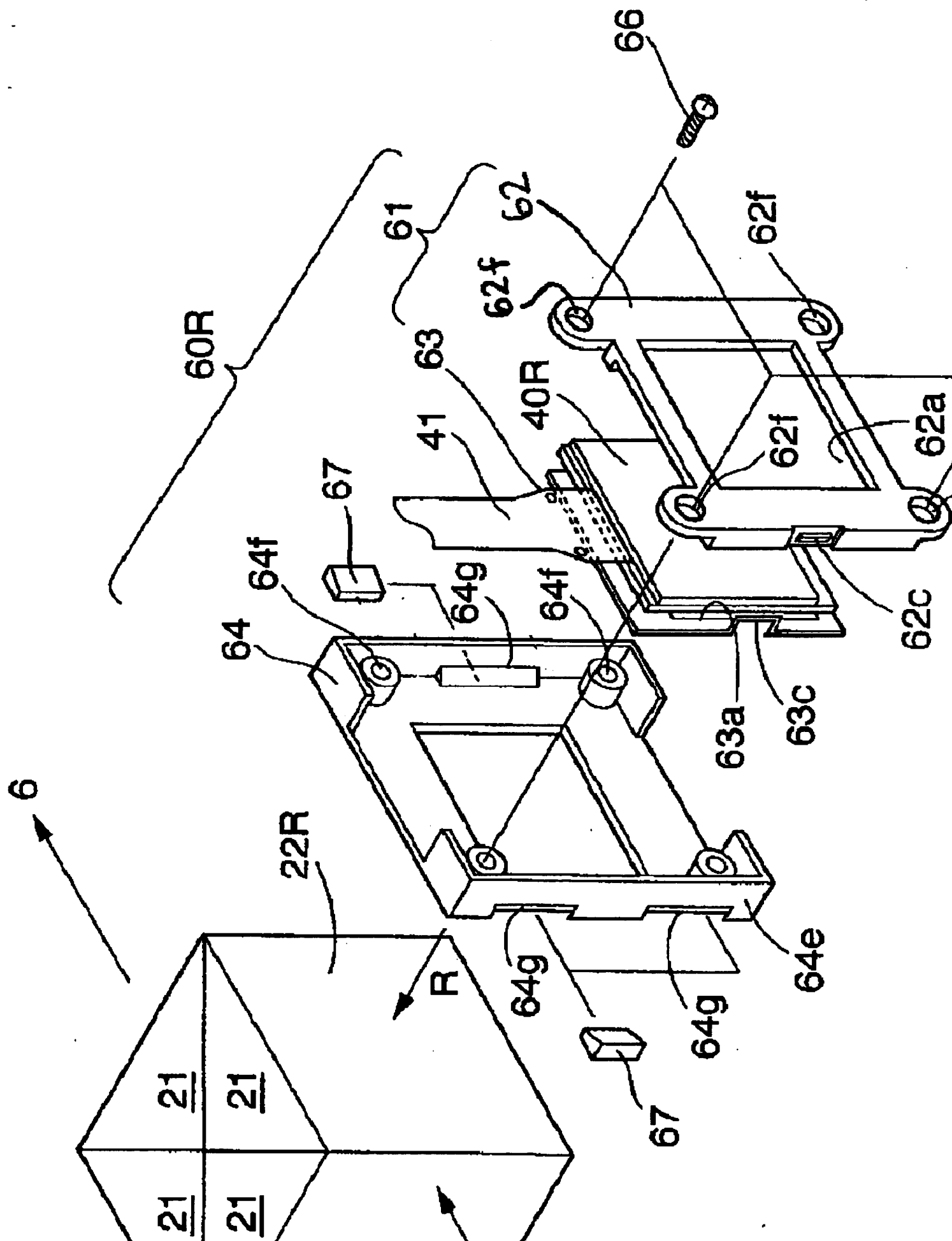
[Document to be Amended] DRAWINGS
[Item(s) to be Amended] drawing 5
[Method of Amendment] Modification
[Proposed Amendment]
[Drawing 5]



[Procedure amendment 37]
[Document to be Amended] DRAWINGS
[Item(s) to be Amended] drawing 7
[Method of Amendment] Modification
[Proposed Amendment]
[Drawing 7]



[Procedure amendment 38]
[Document to be Amended] DRAWINGS
[Item(s) to be Amended] drawing 8
[Method of Amendment] Modification
[Proposed Amendment]
[Drawing 8]



[Translation done.]

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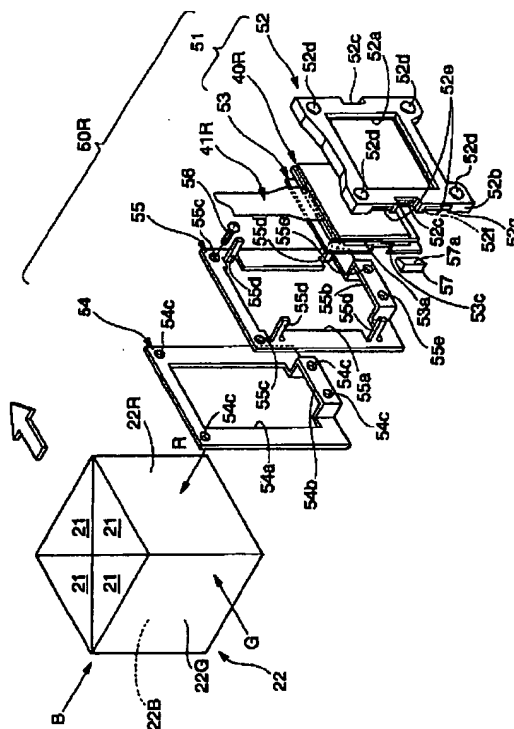
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(54) 【発明の名称】 投写型表示装置

(57) 【要約】

【課題】 プリズム合成体の光入射面に対して適切な状態でライトバルブを取付けることのできる機構を提案すること。

【解決手段】 プリズム合成体22の光入射面22Rには、液晶パネルユニット50Rが取付けられている。このユニット50Rは、液晶パネル40Rを保持したパネル枠板51と、光入射面22Rに接着固定された固定枠板54を有している。パネル枠板51は、中間枠板55を介して、固定枠板54の側にねじ止めされる。楔57を用いて、光入射面22Rに対してパネル枠板51の位置を調整することにより、そこに保持されている液晶パネル40Rを確実に位置決め固定できるので、画素合わせのずれ量を抑え、フォーカス調整を正確に合わせられるのでより高精細化を容易に可能とする。加えて、不良となった液晶パネルを交換可能としながら、プリズム合成体の大型化を回避可能とする。



【特許請求の範囲】

【請求項1】 光源からの光束を複数色の光束に分解し、各色光束をライトバルブを通して画像情報に対応させて変調し、変調した後の各色の変調光束を光合成手段により再合成して、投写手段を介して投写面上に拡大投写する投写型表示装置であって、前記光合成手段の光入射面に固定される固定枠板と、前記ライトバルブを保持しているライトバルブ枠板と、このライトバルブ枠板を前記固定枠板に着脱可能に固定する固定手段と、前記ライトバルブの位置決めを行なう位置決め手段とを有することを特徴とする投写型表示装置。

【請求項2】 請求項1において、前記ライトバルブ枠板および前記固定枠板のうちの少なくとも一方は、前記ライトバルブの四周を覆う周囲壁を備えていることを特徴とする投写型表示装置。

【請求項3】 請求項1または2において、前記位置決め手段は、前記ライトバルブの位置を調整するための調整部材を含むことを特徴とする投写型表示装置。

【請求項4】 請求項3において、前記ライトバルブ枠板に、調整部材案内手段を設けたことを特徴とする投写型表示装置。

【請求項5】 請求項3において、前記調整部材は、当該調整部材をチャッキングする際に利用する少なくとも1つの係合部を備えていることを特徴とする投写型表示装置。

【請求項6】 請求項1または2において、前記位置決め手段は、前記ライトバルブ枠板の対向する側部の中央付近に設けられたことを特徴とする投写型表示装置。

【請求項7】 請求項1または2において、前記固定枠板および前記ライトバルブ枠板のうちの少なくとも一方の板は、当該板をチャッキングするための係合部を備えていることを特徴とする投写型表示装置。

【請求項8】 請求項1または2において、更に、前記固定枠板と前記ライトバルブ枠板の間に配置された中間枠板を有し、この中間枠板は、前記固定手段によって前記固定枠板に固定され、前記ライトバルブは、前記ライトバルブ枠板と前記中間枠板との間に挟持されていることを特徴とする投写型表示装置。

【請求項9】 請求項8において、更に、前記中間枠板と前記ライトバルブ枠板を仮止めするための仮止め手段を有していることを特徴とする投写型表示装置。

【請求項10】 請求項9において、前記仮止め手段は、前記中間枠板および前記パネル枠板の何れか一方の板に形成した係合突片と、他方の板に形成した係合孔とを含むことを特徴とする投写型表示装置。

【請求項11】 請求項10において、前記係合孔に差し込まれた前記係合突片は接着固定されていることを特徴とする投写型表示装置。

【請求項12】 請求項8において、前記位置決め手段は前記ライトバルブの位置を調整する調整部材を含むことを特徴とする投写型表示装置。

【請求項13】 請求項12において、前記ライトバルブ枠板に調整部材案内手段を設けたことを特徴とする投写型表示装置。

【請求項14】 請求項12において、前記調整部材は、当該調整部材をチャッキングする際に利用する少なくとも1つの係合部を備えていることを特徴とする投写型表示装置。

【請求項15】 請求項8において、前記位置決め手段は、前記ライトバルブ枠板の対向する側部の中央付近に設けられたことを特徴とする投写型表示装置。

【請求項16】 請求項1において、前記ライトバルブ枠板と前記固定枠板との間に前記ライトバルブが挟持されていることを特徴とする投写型表示装置。

【請求項17】 請求項1から16のいずれかにおいて、前記ライトバルブは液晶ライトバルブであることを特徴とする投写型表示装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、光源からの白色光束を、赤、青、緑の3色光束に分解し、これらの各色光束を液晶パネル等のライトバルブを通して画像情報に対応させて変調し、変調した後の各色の変調光束を光合成手段によって再合成して、投写手段を介して投写面上に拡大投写する投写型表示装置に関するものである。

【0002】さらに詳しくは、本発明は、この形式の投写型表示装置における光合成手段を構成しているプリズム合成体に対する液晶パネルの取付け機構に関するものである。

【0003】

【従来の技術】上記構成の投写型表示装置では、光合成手段であるプリズム合成体の各色光束の光入射面にライトバルブとしての液晶パネルが取付けられている。液晶パネルをプリズム合成体に取り付けるための機構としては、例えば、特開平6-118368号公報に開示された形式のものがある。この形式の取付け機構では、プリズム合成体の光入射面に対してライトバルブとしての液晶パネルが接着剤によって直接に貼り付け固定されている。

【0004】ライトバルブを接着固定した場合には、特に、赤、緑、青色に分離された光を変調する複数のライトバルブの相互の画素合わせ調整（アライメント調整）のための機構、投写レンズの焦点許容深度内に被写体となる各画像形成面が位置するように調整（フォーカス調整）する機構を省略できる。従って、投写型表示装置の光学系の小型・軽量化、および部品点数の削減を実現できる。

【0005】

【発明が解決しようとする課題】しかし、プリズム合成体の光入射面にライトバルブを直接に接着固定した場合には、次のような解決すべき課題がある。

【0006】第1に、外部から装置内部に外光が侵入すると、当該外光がライトバルブに入射するおそれがある。このような侵入光を受けるとライトバルブの各素子が誤動作するおそれがある。

【0007】第2に、ライトバルブに直接に触れた状態で取り扱うことは、それを破損する等の弊害が起きるので好ましくない。例えば、プリズム合成体にライトバルブを接着する際に、ライトバルブを直接に治具によってチャッキングすると、ライトバルブの縁、角等が破損するおそれがある。また、液晶パネルのように静電気に弱いライトバルブを用いる場合は、作業員がライトバルブを直に持ってプリズム合成体に貼り付ける作業を行なうことは好ましくない。

【0008】第3に、プリズム合成体に接着したライトバルブは、経時変化によりその画素の一部に欠陥等が発生することがある。ライトバルブに欠陥が発生した場合には、それを新しいものに交換する必要がある。しかし、ライトバルブはプリズム合成体に接着固定されているので、欠陥のあるライトバルブのみを交換することが困難である。すなわち、プリズム合成体の光入射面を傷付けることなく、そこに接着固定されている液晶パネルのみを剥がすことは簡単ではない。このため、例えば、プリズム合成体も含めて交換しなければならない場合もあり、経済的でない。

【0009】本発明の課題は、このような課題を解消可能なライトバルブの取付け機構を備えた投写型表示装置を実現することにある。

【0010】

【課題を解決するための手段】上記の課題を解決するために、本発明は、光源からの光束を複数色の光束に分解し、各色光束をライトバルブを通して画像情報に対応させて変調し、変調した後の各色の変調光束を光合成手段により再合成して、投写手段を介して投写面上に拡大投写する投写型表示装置において、外光の侵入、破損等が起きないようにライトバルブの周囲を保護すると共に、ライトバルブを光合成手段に対して直接に接着固定しないで済む構成を採用している。

【0011】すなわち、本発明では、前記光合成手段の光入射面に固定される固定枠板と、前記ライトバルブを保持しているライトバルブ枠板と、このライトバルブ枠板を前記固定枠板に着脱可能に固定する固定手段と、前記ライトバルブの位置決めを行なう位置決め手段とを有する構成を採用している。

【0012】また、本発明は、上記構成に加えて、前記ライトバルブ枠板および前記固定枠板のうちの少なくとも一方によって、前記ライトバルブの四周を覆う周囲壁を形成する構成を採用している。

【0013】前記位置決め手段は、前記ライトバルブの位置を調整するための調整部材を含む構成とすることができる。この場合、前記ライトバルブ枠板に、調整部材案内手段を設けることが望ましい。

【0014】治具等により調整部材を簡単に取り扱うことができるように、前記調整部材は、当該調整部材をチャッキングする際に利用する少なくとも1つの係合部を備えていることが望ましい。

【0015】また、前記位置決め手段は、前記ライトバルブ枠板の対向する側部の中央付近に設けることが望ましい。このようにすれば、位置決め対象の部材の熱変形による応力集中等を回避できる。

【0016】一方、治具等により固定枠板、ライトバルブ枠板を簡単に取り扱うことができるように、前記固定枠板、前記ライトバルブ枠板には、当該板をチャッキングするための係合部を備えていることが望ましい。

【0017】次に、本発明では、前記固定枠板および前記ライトバルブ枠板に加えて、これらの間に配置された中間枠板を備えた構成を採用している。この場合、この中間枠板は、前記固定手段によって前記固定枠板に固定され、前記位置決め手段によって前記ライトバルブ枠板に位置決めされた状態で固定される。

【0018】この場合、前記中間板と前記ライトバルブ枠板を仮止めするための仮止め手段を有した構成を採用し、当該仮止め手段によって仮止めされた前記中間板と前記ライトバルブ枠板を前記位置決め手段によって位置決めすることが望ましい。このようにすれば、仮止めされた状態で位置決め作業を行うことができるので、位置決め作業を簡単にを行うことができる。

【0019】前記仮止め手段は、前記中間枠板および前記ライトバルブ枠板の何れか一方の板に形成した係合突片と、他方の板に形成した係合孔とを含む構成とすることができる。この場合、これらの間を接着剤により仮止めすればよい。

【0020】ここで、中間枠板を備えている場合においても、前記位置決め手段は前記ライトバルブの位置を調整する調整部材を含む構成を採用できる。また、前記ライトバルブ枠板に調整部材案内手段を設けた構成を採用できる。さらに、前記調整部材は、当該調整部材をチャッキングする際に利用する少なくとも1つの係合部を備えた構成とすることができる。さらにまた、前記位置決め手段は、前記ライトバルブ枠板の対向する側部の中央付近に設ける構成にできる。

【0021】一方、本発明においては、前記ライトバルブを、前記ライトバルブ枠板と前記固定枠板との間に挟持する構成を採用することもできる。

【0022】このように構成した本発明の投写型表示装置においては、ライトバルブがライトバルブ枠板によって保持されている。また、光合成手段の光入射面には固定枠板が固定され、この固定枠板に対して、ライトバル

ブが保持されたライトバルブ枠板が直接に、あるいは中間枠板を介して着脱可能に固定されている。

【0023】従って、ライトバルブが経時変化によって欠陥が発生した場合には、ライトバルブを保持しているライトバルブ枠板を、光合成手段に固定されている固定枠板から外して、新たなライトバルブを保持したライトバルブ枠板を固定枠板に取付ければよい。このように、光合成手段にライトバルブが直接に固定されていないので、ライトバルブの交換作業を簡単に行なうことができ、また、交換作業時に光合成手段の表面を傷付けてしまうこともない。

【0024】また、本発明の投写型表示装置では、ライトバルブはライトバルブ枠板によってその周囲が保護されているので、光合成手段等への取付け時等において、ライトバルブに直接触れた状態で作業を行うことが無い。従って、ライトバルブの破損を防止できる。また、投写型表示装置に組み込まれて使用される状態においては、その外周がライトバルブ枠板によって覆われているので、外光が侵入して誤動作が起きるおそれもない。

【0025】また、上記のライトバルブとしては、液晶装置を用いることができる。本発明は、静電気に弱く、また外光の侵入に対して誤動作を起こしやすい液晶装置の場合に、特に有効である。

【0026】さらに、上記ライトバルブとしては、光透過型のものと光反射型のものがある。光反射型のライトバルブを用いる場合には、光合成手段が光源からの光束を複数色の光束に分解する光分離手段としての役割も果たすのが一般的である。

【0027】投写型表示装置としては、投写面を観察する側から投写が行われる前面投写型表示装置と、投写面を観察する側とは反対の方向から投写が行われる背面投写型表示装置の2種類が存在するが、本発明はいずれのタイプにも適用可能である。なお、上記光合成手段としてダイクロイックプリズムを用いる場合は、ダイクロイックプリズムの面に固定枠板、ライトバルブ枠板、固定手段、位置決め手段を用いてライトバルブを位置決め固定することになるが、この固定構造は、カメラ等においてCCD等の固体撮像素子を色分解プリズムに位置決め固定する構造に応用することが考えられる。

【0028】

【発明の実施の形態】以下に、図面を参照して本発明を適用した投写型表示装置を説明する。

【0029】（全体構成）図1には本発明を適用した投写型表示装置の外観を示してある。本例の投写型表示装置1の外装ケース2は直方体形状をしている。この外装ケース2は、基本的には、アッパーケース3と、ロアーケース4と、装置前面を規定しているフロントケース5から構成されている。フロントケース5の中央からは投写レンズユニット6の先端側の部分が突出している。

【0030】図2には、投写型表示装置1の外装ケース

2の内部における各構成部分の配置を示してある。この図に示すように、外装ケース2の内部において、その後端側には電源ユニット7が配置されている。これよりも装置前側に隣接した位置には、光源ランプユニット8および光学ユニット9が配置されている。光学ユニット9の前側の中央には、投写レンズユニット6の基端側が位置している。一方、光学ユニット9の一方の側には、装置前後方向に向けて入出力インタフェース回路が搭載されたインタフェース基板11が配置され、これに平行に、ビデオ信号処理回路が搭載されたビデオ基板12が配置されている。さらに、光源ランプユニット8および光学ユニット9の上側には、装置駆動制御用の制御基板13が配置されている。装置前端側の左右の角には、それぞれスピーカ14R、14Lが配置されている。

【0031】光学ユニット9の上面側の中央には冷却用の吸気ファン15Aが配置され、光学ユニット9の底面側の中央には冷却用循環流形成用の循環用ファン15Bが配置されている。また、光源ランプユニット8の裏面側である装置側面には排気ファン16が配置されている。そして、電源ユニット7における基板11、12の端に面する位置には、吸気ファン15Aからの冷却用空気流を電源ユニット7内に吸引するための補助冷却ファン17が配置されている。

【0032】さらに、電源ユニット7の直上には、その装置左側の位置に、フロッピーディスク駆動ユニット18が配置されている。

【0033】（光学ユニットおよび光学系）図3（A）には、光学ユニット9の部分を示してある。この図に示すように、光学ユニット9は、その色合成手段を構成しているプリズムユニット20以外の光学素子が上下のライトガイド901、902の間に上下から挟まれて保持された構成となっている。上ライトガイド901および下ライトガイド902は、それぞれ、アッパーケース3およびロアーケース4の側に固定ねじにより固定されている。また、これらの上下のライトガイド板901、902は、プリズムユニット20の側に同じく固定ねじによって固定されている。

【0034】プリズムユニット20は、ダイキャスト板である厚手のヘッド板30の裏面に固定ねじによって固定されている。このヘッド板30の前面には、投写手段としての投写レンズユニット6の基端側が同じく固定ねじによって固定されている。したがって、本例では、ヘッド板30を挟み、プリズムユニット20と投写レンズユニット6とが一体となるように固定された構造となっている。このように剛性の高いヘッド板30を挟み、これらの双方の部品が一体化されている。したがって、衝撃等が投写レンズユニット6の側に作用しても、これらの双方の部材に位置ずれが発生することが無い。

【0035】図3（B）には、投写型表示装置1に組み込まれている光学系の概略構成を示してある。本例の光

学系は、光源ランプ805と、均一照明光学素子であるインテグレートレンズ921、922から構成される照明光学系923と、この照明光学系923から出射される白色光束Wを、赤、緑、青の各色光束R、G、Bに分離する色分離光学系924と、各色光束を変調するライトバルブとしての3枚の液晶パネル40R、40G、40Bと、変調された色光束を再合成する色合成光学系としてプリズム合成体20と、合成された光束を投写面上に拡大投写する投写レンズユニット6から構成される。また、色分離光学系924によって分離された各色光束のうち、青色光束Bに対応する液晶パネル40Bに導く導光系927を有している。

【0036】光源ランプ805としては、ハロゲンランプ、メタルハライドランプ、キセノンランプ等を用いることができる。均一照明光学系923は、反射ミラー931を備えており、照明光学系からの出射光の光軸1aを装置前方向に向けて直角に折り曲げるようにしている。このミラー931を挟み、インテグレートレンズ921、922が前後に直交する状態に配置されている。

【0037】色分離光学系924は、青緑反射ダイクロックミラー941と、緑反射ダイクロックミラー942と、反射ミラー943から構成される。白色光束Wは、まず、青緑反射ダイクロックミラー941において、そこに含まれている青色光束Bおよび緑色光束Gが直角に反射されて、緑反射ダイクロックミラー942の側に向かう。赤色光束Rはこのミラー941を通過して、後方の反射ミラー943で直角に反射されて、赤色光束の出射部944からプリズム合成体20の側に出射される。ミラー941において反射された青および緑の光束B、Gは、緑反射ダイクロックミラー942において、緑色光束Gのみが直角に反射されて、緑色光束の出射部945から色合成光学系の側に出射される。このミラー942を通過した青色光束Bは、青色光束の出射部946から導光系の側に出射される。本例では、均一照明光学素子の白色光束の出射部から、色分離光学系924における各色光束の出射部944、945、946までの距離が全て等しくなるように設定されている。

【0038】色分離光学系924の各色光束の出射部944、945、946の出射側には、それぞれ集光レンズ951、952、953が配置されている。したがって、各出射部から出射した各色光束は、これらの集光レンズ951、952、953に入射して平行化される。

【0039】このように平行化された各色光束R、G、Bのうち、赤色および緑色の光束R、Gは液晶パネル40R、40Gに入射して変調され、各色光に対応した画像情報が付加される。すなわち、これらの液晶パネル40R、40G、40Bは、不図示の駆動手段によって画像情報に対応する画像信号によってスイッチング制御され、これにより、ここを通過する各色光の変調が行われる。このような駆動手段は公知の手段をそのまま使用す

ることができる。一方、青色光束Bは、導光系927を介して対応する液晶パネル40Bに導かれて、ここにおいて、同様に画像情報に応じて変調が施される。なお、本例の液晶パネル40R、40G、40Bは、例えば、ポリシリコンTFTをスイッチング素子として用いたものを使用できる。

【0040】導光系927は、入射側反射ミラー971と、出射側反射ミラー972と、これらの間に配置した中間レンズ973と、液晶パネル40Bの手前側に配置した集光レンズ953から構成される。各色光束の光路長、すなわち、光源ランプ805から各液晶パネルまでの距離は青色光束Bが最も長くなり、したがって、この光束の光量損失が最も多くなる。しかし、導光系927を介在させることにより、光量損失を抑制できる。よって、各色光束の光路長を実質的に等価にすることができる。

【0041】次に、各液晶パネル40R、40G、40Bを通して変調された各色光束は、プリズム合成体22に入射され、ここで再合成される。本例では、ダイクロイックプリズムからなるプリズム合成体22を用いて色合成光学系を構成している。ここで再合成されたカラー画像は、投写レンズユニット6を介して、所定の位置にある投写面7上に拡大投写される。

【0042】(プリズムユニットおよびヘッド板の構造) 図4には、ヘッド板30と、このヘッド板30に取り付けたプリズムユニット20とを取り出して示してある。この図に示すように、ヘッド板30は、装置の幅方向に向けて垂直な姿勢で延びる垂直壁31と、この垂直壁31の下端から水平に延びる底壁32から基本的に構成されている。垂直壁31には、プリズムユニット20からの出射光が通過するための矩形の開口31bが形成されている。また、この垂直壁31には、多数の補強リブが形成され、その剛性を高めてある。この垂直壁31を挟み、位置合わせした状態で、プリズムユニット20および投写レンズユニット6が固定されている(図3

(A)参照)。従って、これらの一体性が高く、衝撃力等が作用しても、相互の位置ずれが発生するおそれは極めて少ない。

【0043】ヘッド板30の底壁32の上面にはプリズムユニット20が設置されている。プリズムユニット20は、直角二等辺三角形の断面をした4個のプリズム21を、それらの斜面を相互に接合することによって構成された直方体形状のプリズム合成体22と(図5参照)、プリズム支持板33とを備えている。プリズム合成体22の底部は、プリズム支持板33の表面に接着等の手段により固定されており、プリズム支持板33がヘッド板の底壁32に取付け固定されている。プリズム合成体22の側面のうち光入射面として機能する三方の側面には、それぞれ、同一構造の液晶パネルユニット50R、50G、50Bが取付けられている。各液晶パネル

ユニット50R、50G、50Bには、それぞれ、液晶パネル40R、40G、40Bが保持されている。

【0044】（液晶パネルの取付け構造）図5には、液晶パネルユニット50R、50G、50Bのうち、液晶パネル40Rが保持されている液晶パネルユニット50Rの各構成部品を分解して示してある。この図を参照して液晶パネル40Rをプリズム合成体22に取付けたるための取付け構造を説明する。

【0045】図5に示すように、液晶パネルユニット50Rは、液晶パネル40Rを保持しているパネル枠板51を備え、このパネル枠板51は第1の枠板52と第2の枠板53を備えている。これらの枠板52、53の間に液晶パネル40Rが挟み込まれた状態で保持されている。

【0046】液晶パネルユニット50Rは、更に、プリズム合成体22の光入射面22Rに接着固定される固定枠板54を備えている。パネル枠板51は、中間枠板55を介して、この固定枠板54の側に着脱可能な状態で固定される。

【0047】各部分の構造を詳細に説明する。まず、パネル枠板51について説明すると、その第1の枠板52は、光通過用の矩形開口52aを備えていると共に、四周には一定の厚さの周囲壁52bが形成されている。第2の枠板53にも光通過用の矩形開口53aが形成されている。この第2の枠板53は、第1の枠板52の周囲壁52bの内側に嵌まり込む大きさとなっている。また、第2の枠板53の左右の縁の中央には係合突起53cが形成されている。この係合突起53cが嵌まり込む係合溝52cが、第1の枠板53の左右の周囲壁52bの外側面中央に形成されている。従って、第1および第2の枠板52、53の間に液晶パネル40Rを挟んだ状態で相互に重ね合わせて、それらの係合突起53cを対応する係合溝52cにはめ込めば、これらの枠板52、53の間に液晶パネル40Rが挟み込まれた状態で保持されたパネル枠体51が構成される。

【0048】中間枠板55は、パネル枠板51の第1の枠板52とほぼ同一か、あるいはこれより一回り大きく形成された矩形枠であり、光通過用の矩形開口55aを備えている。この中間枠板55には、その矩形開口55aの四隅に、枠板表面から垂直に延びる係合突片55dが形成されている。これに対して、パネル枠板51の第1の枠板52の側には、各係合突片55dに対応する位置に、これらを差し込み可能な係合孔52dが形成されている。従って、パネル枠板51の各係合孔52dに、中間枠板55の係合突片55bを合わせて相互に重ね合わせると、各係合孔52dに各係合突片55dが差し込まれた仮止めが可能な状態が形成される。

【0049】一方、固定枠板54も光通過用の矩形開口54aが形成された矩形の枠板である。この固定枠板54の裏面がプリズム合成体22の光入射面22Rに接着

剤によって固定される。この固定枠板54の上側の左右の隅にはねじ孔54cが形成されている。これらのねじ孔54cに対応する中間枠板55にもねじ孔55cが形成されている。

【0050】また、固定枠板54の下枠部分には、中間枠板55の側に向けて突出した突出枠54bが形成されている。中間枠板55の下枠部分には、この突出枠54bが裏面側から嵌まり込む形状の突出枠55bが形成されている。これらの突出枠54b、55bの上に乗り上げた状態でパネル枠板51が保持される。また、これらの突出枠54b、55bには、左右2箇所にねじ孔54e、55eが形成されている。

【0051】このように、固定枠板55および中間枠板54には、相互に対応する位置にねじ孔54c、54eおよび55c、55eが形成されており、これらのねじ孔にねじ込まれた4本の皿ねじ56（図においては1本のみ示してある。）によって、これらが締結固定される。すなわち、プリズム合成体22に貼り付けられている固定枠板54に対して中間枠板55がねじ止めされる。

【0052】さらに、液晶パネルユニット50Rは、位置決め手段として、4個の楔57を備えている。図5においてはそのうちの1個のみを示してある。この楔57の傾斜面57aが当接する楔案内面52eが、パネル枠板51の第1の枠板52の左右の周囲壁の部分に形成されている。中間枠板55にパネル枠板51を仮止めした後、4個の楔57を、第1の枠板52の左右に打ち込み、これらの楔57の押し込み量を調整して、液晶パネル40Rの位置決めを行なうようになっている。

【0053】この構成の液晶パネルユニット50Rは次のような手順でプリズム合成体22の光入射面22Rに取付けられる。まず、液晶パネル40Rが保持されたパネル枠板51を用意する。次に、プリズム合成体22の面22Rに、固定枠板54を位置決めして接着固定する。接着剤としては紫外線硬化型接着剤等を用いることができる。次に、接着固定した固定枠板54の表面に、中間枠板55を位置決めして、4本のねじ56によって、当該中間枠板55をねじ止めする。しかる後に、液晶パネル40Rが保持されているパネル枠板51を、中間枠板55に位置決めして、そこに仮止めする。すなわち、中間枠板55の係合突片55dをパネル枠板51の係合孔52dに一致させ、この状態で、パネル枠板51を中間枠板55に向けて押し込む。なお、固定枠板54をプリズム合成体22に接着固定する前に、固定枠板54と中間枠板55をねじ56で予め一体化しておくと位置精度が出しやすくなる。

【0054】この後は、位置決め手段としての楔57を用いて、プリズム合成体22の面22Rに対して、液晶パネル40Rの位置決めを行なう。すなわち、4個の楔57を、第1の枠板52に形成した楔案内面52eに沿

って、仮止めされているパネル枠板51と中間枠板55の間に差し込む。そして、各楔57の差し込み量を調整することにより、液晶パネル40Rのアライメント調整およびフォーカス調整を行なう。

【0055】位置決めができたところで、これらの楔57を、接着剤を用いて位置決め対象の部材であるパネル枠板51および中間枠板55に接着固定する。この場合に使用する接着剤としても、紫外線硬化型の接着剤を用いることができる。

【0056】ここで、上記の楔57の位置決め作業および楔57の接着固定作業を、工程順序に従ってより詳しく説明する。

【0057】まず、投写レンズ6のフォーカス面内に液晶パネル40Gのフォーカス面を専用の調整装置を用いて合わせ込む。この状態で、前述の通り、中間板55の係合突片55dがライトバルブ枠板51の係合孔52dに入って形成される隙間に紫外線硬化型の接着剤を注入し、紫外線照射によって、硬化させて仮固定する。次に、中間枠板55と第1の枠板52に設けた楔案内面52eとによって、紫外線硬化型接着剤に楔57の露出端面から紫外線を照射して接着し、本固定を行う。液晶パネル40G、40R、40Bの中央に配置される液晶パネル40Gを基準として、同様に液晶パネル40R、40Bのフォーカス調整及び相互間の画素合わせ調整をして仮固定および本固定を行う。

【0058】なお、仮固定作業は、ヘッド板30にプリズム合成体22と投写レンズ6を取り付けた状態で調整装置にセットして行うので、部品個々の特性に合わせた最適調整が可能となる。また、ライトバルブ枠板51の調整装置へのチャッキングは第1の枠板52aの外形を基準として行っている。

【0059】液晶パネル40R以外の液晶パネル40G、40Bを保持している液晶パネルユニット50G、50Bも同一構造であるのでその説明は省略する。

【0060】このようにしてプリズム合成体22の3面22R、22B、22Gに、液晶パネルユニット50R、50G、50Bを取付けた状態を図4に示す状態である。なお、この図4において、各液晶パネルユニット50R、50G、50Bから上方に向けて延びている部材は、配線用のフレキシブルケーブル41R、41G、41Bである。

【0061】以上のように構成した液晶パネルユニット50Rによれば、次のような効果が得られる。

【0062】第1に、液晶パネル40Rは、その四周縁の部分が、矩形のパネル枠板51によって覆われて保護された状態にある。従って、液晶パネル40Rに直接触れて、プリズム合成体22の側への取付け作業を行なう必要がない。このため、液晶パネル40Rが他の部分に当たる等して破損あるいは欠損してしまうことを防止できる。また、液晶パネル40Rの周囲は枠板51につ

覆われており、外光を遮断できる。従って、外光が侵入して液晶パネル40に誤動作が発生することもない。

【0063】第2に、液晶パネル40Rを保持したパネル枠板51は、中間枠板55を介して、プリズム合成体22の面22Rに対して、ねじ止めされて着脱可能となっている。従って、例えば、液晶パネル40Rに欠陥が発生した場合には、ねじ56を外すという簡単な作業により、その交換を行なうことができる。また、プリズム合成体22に対して液晶パネル40Rが直接に接着固定されていないので、このような交換時に、プリズム合成体22の側を傷付けてしまうこともなく、しかも高額の部品を無駄なく使用できる。

【0064】第3に、液晶パネル40Rを保持したパネル枠板51は、中間枠板55に仮止めすることができる。この仮止め状態を形成した後に、楔57を用いて、液晶パネル40Rとプリズム合成体22の面22Rとの位置決めを行なうことができる。このように、仮止め状態を形成できるので、別工程で楔57を用いた位置決め作業を簡単に行なうことができるので、設備のサイクルタイムの向上に資する。ここで、楔57としては、一般にはガラス製のものを使用することができる。しかし、第1の枠板52を樹脂成形品とした場合にはガラスに比べて熱膨張率が大きいため、熱膨張の違いにより楔57がこれらの枠板から剥離しやすくなったり、楔57が温度変化によって破壊される場合がある。これを回避するためには、楔57をアクリル系等の樹脂成形品とすることが望ましい。また、楔57をアクリル系の材質にすることによって、成形加工ができるため、ガラス剤に比して大幅にコスト低減を図れる。なお、楔57の素材として紫外線を透過させる材料を用いることにより、楔57を接着固定するための接着剤として温度上昇が少なく、硬化時間の短い紫外線硬化型接着剤を使用することができる。

【0065】また、第1の枠板52に楔案内面52eを形成したことにより、その上下には上端面52f、52gが形成されており、これらの三面により楔57が案内される。すなわち、この部分に接着剤を充填して楔57を差し込めば、接着剤の表面張力によって楔57はこれらの三面によって案内されながら自動的に内部に移動する。従って、工程内で遭遇する外乱に対して強くなり、楔57の装着作業が簡単である。

【0066】なお、本例では、中間枠板55に対するパネル枠板51の仮固定に接着剤を用いているが、この代わりに、半田付け等を用いてもよい。第1の枠板52等が樹脂製である場合には、接合部分に金属部材を貼り付けたもの、あるいは、接合部分にメタライズ層を形成したものをを用いればよい。

【0067】次に、上記の第1の枠板52、中間枠板55、固定枠板54は、ガラスファイバあるいは炭酸カルシウムを混入した熱硬化性樹脂の成形品とすることが

きる。このような樹脂素材を用いれば、その熱膨張係数が一般の樹脂素材に比べてガラスに近くなる。このため、プリズム合成体22に貼り合わせた状態において熱変形に起因した画素ずれ等を回避できる。

【0068】ここで、プリズム合成体22に対して固定枠板54を接着固定するための接着剤としては前述したように紫外線硬化型接着剤を用いることができるが、接着性を向上させるために下地処理材料を塗布することが望ましい。すなわち、プリズム合成体22においては、前述したように、赤色光束の入射面22Rと青色光束の入射面22Bが対峙している。青色光束は波長が短いので、その一部がプリズム合成体22の反射膜を透過して反対側の赤色光束の入射面22Rに至る場合がある。このような逆光が液晶パネル40Rに入射すると誤動作を起こしてしまう。これを回避するために、一般的に、赤色光束の入射面22Rにフィルタを取り付けて、このような逆光を遮断している。

【0069】赤色光束の入射面22Rにのみフィルタを取り付けるのは、青色光束の逆光による影響が最も大きいためであるが、他の光束の逆光による影響が大きい場合には、この限りでない。他の面にフィルタを設けたり、あるいは複数の面にフィルタを設けてもよい。

【0070】しかしながら、このようなフィルタが存在すると、それによって、接着固定時の紫外線が遮られて、固定枠板54をプリズム合成体22の入射面22R、22G、22Bに接着固定するための紫外線硬化型接着剤が紫外線照射不足の部分が発生するおそれがある。この弊害を回避して固定枠板54を確実に入射面22Rに接着固定するためには、上記のように、これらの接着面に下地処理材料を塗布しておくこと、および嫌気タイプの接着剤を併用することが望ましい。勿論、このようなフィルタが存在しない入射面において同様な処理を施してもよい。

【0071】なお、接着剤としては、紫外線硬化型接着剤の使用について説明したが、これ以外の接着剤を使用してもよい。例えば、ホットメルトタイプの接着剤を使用して、固定枠板54の接着固定、楔77の接着固定を行うようにすれば、上記のフィルタによる問題を考慮する必要がない。

【0072】（液晶パネルユニット50Rの第1の変形例）パネル枠体51を中間枠板55に仮止めする必要がない場合には、図6に示すように、パネル枠体51と中間枠板55の間に形成した仮止め機構を省略すればよい。すなわち、パネル枠板51の側に形成した係合孔52dと、中間枠板55の側に形成した係合突片55dを省略すればよい。この場合、パネル枠体51は楔57のみによって中間枠体55に固定される。

【0073】図6に示す構成の液晶パネルユニット50Rを用いた場合においても、液晶パネルユニット50Rにより得られる上記の第1および第2の効果を得るこ

とができると共に、プリズムユニット20を小型化するのに有効となる。

【0074】（液晶パネルユニット50Rの第2の変形例）図7には液晶パネルユニット50Rの第2の変形例に係る液晶パネルユニット70Rを分解した状態で示してある。なお、図5に示す液晶パネルユニット50Rに対応する部分には同一の符号を付してそれらの説明は省略する。

【0075】図7に示すように、液晶パネルユニット70Rは、液晶パネル40Rを保持しているパネル枠板71を備えている。このパネル枠板71は、液晶パネルユニット50Rのパネル枠板51と同様に第1および第2の枠板72、73を備え、これらの枠板の間に液晶パネル40Rが挟まれて保持された構造となっている。図においては第1の枠板72のみが表わされており、第2の枠板73および液晶パネル40Rが既に第1の枠板72に側に取付け固定された状態を示してある。液晶パネルユニット70Rは、更に、プリズム合成体22の光入射面22Rに接着固定される固定枠板74を備えている。パネル枠板71は、中間枠板75を介して、この固定枠板74に着脱可能な状態で固定される。

【0076】パネル枠板71は、基本的には前述した液晶パネルユニット50Rのパネル枠板51と同一である。その第1の枠板72は、光通過用の矩形開口72aを備えていると共に、四周には一定の厚さの周囲壁72bが形成されている。第2の枠板73にも光通過用の矩形開口（図示せず）が形成されている。この第2の枠板73は、第1の枠板72の周囲壁72bの内側に丁度嵌まり込む大きさとなっている。従って、第1および第2の枠板72、73の間に液晶パネル40Rを挟んだ状態で、第2の枠板73の側を第1の枠板72の側にはめ込めば、これらの枠板72、73の間に液晶パネル40Rが挟み込まれた状態で保持されたパネル枠体71が構成される。

【0077】ここで、第1の枠板72および第2の枠板73の嵌め合わせ構造は基本的には、図5に示すパネル枠板51を構成している第1および第2の枠板52、53と同様である。しかし、本例の場合には、第1の枠板72の案内溝72e～gを挟む上下の位置にフックおよび当該フックに係合する係合溝が形成された構成となっている。これらの部分の図示は省略してある。

【0078】次に、中間枠板75は、パネル枠板71の第1の枠板72とほぼ同一の大きさの矩形枠であり、光通過用の矩形開口75aを備えている。この中間枠板75には、その矩形開口75aの四隅に、枠板表面から垂直に延びる係合突片75dが形成されている。これに対して、パネル枠板71の第1の枠板72の側には、各係合突片75dに対応する位置に、これらを差し込み可能な係合孔72dが形成されている。従って、パネル枠板71の各係合孔72dに、中間枠板75の係合突片75

bを合わせて相互に重ね合わせると、各係合孔72dに各係合突起75dが差し込まれた仮止め状態が形成される。

【0079】一方、固定枠板74も光通過用の矩形開口74aが形成された矩形的枠板である。この固定枠板74の裏面がプリズム合成体22の光入射面22Rに接着剤によって固定される。この固定枠板74の上枠部分の両隅、および固定枠板74の下枠部分の左右方向の中央位置には、ねじ孔74cが形成されている。これら3個のねじ孔74cに対応する中間枠板75にもねじ孔75cが形成されている。対応するねじ孔74c、75cに、それぞれ締結用の皿ねじ76を挿入することにより、固定枠板74に対して中間枠板75が固定される。なお、本例では3本のねじ76によって固定枠74に対して中間枠板75が固定されている。ねじの本数は図5に示す例の場合のように4本であってもよいし、それ以上であってもよい。一般には、本数が少ない程、ねじ締結の作業工程が少なくなる。

【0080】ここで、固定枠板74の下枠部分の左右両隅には係合突起74bが形成され、これら2個の係合突起74bに対応する中間枠板75の下枠部分の左右両隅には係合孔75bが形成されている。従って、ねじ76により固定するに際しては、固定枠板74の係合突起74bに対して中間枠板75の係合孔75bを合わせて、中間枠板75を固定枠板74の側に押し込めば、中間枠板75を固定枠板74に仮止めできる。このようにすれば、相互の枠板の位置決め精度を一層向上させることができる。

【0081】本例の液晶パネルユニット70Rも、パネル枠板71を、固定枠板74に固定した中間枠板75に対して位置決めするための位置決め手段を備えている。この位置決め手段は2個の楔77を備えている。この楔77の傾斜面77aが当接する楔案内面72e~gが、パネル枠板71の第1の枠板72の周囲壁72aの左右両側面の上下方向の中央位置に形成されている。中間枠板75にパネル枠板71を仮止めすると、第1の枠板72の楔案内面72eと、これに対峙している中間枠板75の枠部分との間に楔差し込み溝が構成される。従って、中間枠板75にパネル枠板71を仮止めた後に、2個の楔77を、第1の枠板72の左右に打ち込み、これらの楔77の押し込み量を調整すれば、液晶パネル40Rの位置決めを行なうことができる。なお、プリズムユニット20を構成する工程は前述と同様であるので、その説明は省略する。

【0082】以上のように構成した液晶パネルユニット70Rによっても、図5に示す液晶パネルユニット50における場合と同様な効果を得ることができる。

【0083】また、本例では、図5、図6に示す場合とは異なり、固定枠板74、中間枠板75として、フラット形状のものを採用している。図2(B)を参照して説

明したように、プリズム合成体22の下方にはファン15Bが配置されており、冷却風が下から上方に流れる。この流れに乱れが来ないようにするためには、ファン15Bの上方位置に整流板を配置することが望ましい。固定枠板74、中間枠板75としてフラットなものを使用しているので、整流板の取付け位置を液晶パネルユニット70Rの直下まで延ばすことが可能になり、従って、冷却風を効果的に下から上に流すことができる。また、これらの枠板の形状が単純なので、部品加工が容易であり、部品精度も向上するという利点もある。

【0084】これに加えて、液晶パネルユニット70では、位置決め用の楔77を2個用いると共に、それらを第1の枠板72および中間枠板75における左右両側の上下方向の中央位置に取付けて接着固定している。楔77の接着固定位置が適切でないと、第1の枠板72、中間枠板75、あるいは楔77の熱変形に起因して、各部材に過剰な応力集中が発生するおそれがある。また、そのために、楔77が第1の枠板72あるいは中間枠板75から剥離してしまうおそれもある。しかし、上記のように、左右の中央位置に楔77を接着固定してあり、この部分を中心として、第1の枠板72および中間枠板75は上下方向への熱変形が自由である。従って、これらの枠板の熱変形の拘束度合いが低いので、不所望な応力集中、楔の剥離等の弊害を回避できる。

【0085】更に、本例の楔77は、図7から分かるように、その背面77bに2つの盲孔77cを形成してある。これらの盲孔77cは、楔77を治具を用いてチャッキングして取り扱う場合において、チャッキング用の係合部として機能するものである。このような盲孔77cを形成しておけば、そのチャッキングを簡単にでき、従って、その取扱操作が簡単になる。

【0086】なお、本例では楔77の背面にチャッキング時の係合用の盲孔77cを形成してある。チャッキング用の係合部は、これ以外の部材に形成してもよい。例えば、パネル枠板71の周囲壁72aの外面に、盲孔等のチャッキング用係合部を形成してもよい。

【0087】(液晶パネルユニットの別の実施の形態)
図8には、液晶パネルユニットの別の実施の形態を示してある。この図に示す液晶パネルユニット60Rも、液晶パネル40Rを保持したパネル枠板61と、プリズム合成体22の面22Rに接着固定される固定枠板64とを備えている。しかし、前述の例における中間枠板55、75に対応する部分が備わっておらず、パネル枠板61を直接に固定枠板64の側にねじ止めするようになっている。詳細に説明すると、パネル枠板61の構成は、前述した図5のパネル枠板51の構成と同様であり、第1の枠板62と第2の枠板63を備え、これらの間に液晶パネル40Rが挟み込まれた状態で保持される。これらの第1および第2の枠板62、63を係合状態に保持するために、係合フック63cおよび係合爪6

2cが形成されている。また、これらの第1および第2の枠板62、63には光通過用の矩形開口62a、63aが形成されている。

【0088】これに対して、固定枠板64は、矩形枠体部分の四周に、はかま、すなわち一定の幅の周囲壁64eが形成された形状をしている。周囲壁64eの内側に、パネル枠板61がはめ込み可能となっている。また、周囲壁64eの内周側の四隅には、ねじ孔64fが形成されている。これらのねじ孔64fに対応するパネル枠板61の第1の枠板62の四隅にもねじ孔62fが形成されている。これらにねじ66をねじ込むことにより、パネル枠板61は、固定枠板64の側にねじ止め固定される。

【0089】一方、固定枠板64の周囲壁64eには、その一方の側面の上下2箇所に楔案内面64gが形成されている。他方の側面には上下方向の中央の1箇所に楔案内面64gが形成されている。

【0090】この構造の液晶パネルユニット60Rは、パネル枠板61をねじ66によって、固定枠板64の側にねじ止めすることによって構成される。しかる後に、プリズム合成体22の面22Rに対して位置を決める。この状態で、3個の楔67を形成された楔案内面64gの中へ差し込み、既に楔の接合面に塗布されている紫外線硬化型の接着剤の表面張力によって、隙間が零になるように位置決めを保持させる。これによって楔67の位置決めがなされた後は、楔67の露出端面から紫外線を照射して接着剤を硬化させて接着固定する。

【0091】なお、楔67は、固定枠板の周囲壁64eの両側面の中央位置に、各々1ヵ所ずつ配置する構造としてもよい。固定枠板64が大型化される場合、温度変化に伴う膨張・収縮の影響を最小にすることができ、信頼性向上に資する。

【0092】この構成の液晶パネルユニット60Rにおいても、液晶パネル40Rが枠板61によって覆われて保護されている。また、液晶パネル40Rを保持した枠板61は固定枠板64の側にねじ止めされている。従って、液晶パネル40Rが保護された状態にあり、また、外光が侵入することもない。さらに、液晶パネルの交換時には、ねじを外すのみで良いので簡単な作業により行うことができる。また、交換作業時にプリズム合成体の面を傷付けてしまうこともない。

【0093】また、本例の液晶パネルユニット60Rは、パネル枠板61と固定枠板64から構成されているので、全体的に軽量化にすることができ、また薄く構成することができる。特に、液晶パネル60R、G、Bを更に小型化する場合、厚い液晶パネルユニットを三面に貼り付けた場合には、角の部分で双方の液晶パネルユニットが干渉してしまい、プリズム合成体22を含む光学系の部分を小型化できない場合があるが、本例では小型薄型の液晶パネルユニット60を構成できるので、プリズ

ム合成体22を含む光学系の部分の小型化を実現し易い。

【0094】さらに、固定枠板64および第1の枠板62を樹脂材を用いることが可能となり、軽量化およびプリズム支持板33とプリズムユニット20との接着強度を高められ、耐衝撃性のある商品を実現可能とする。

【0095】さらにまた、本例の液晶パネルユニット60Rでは、その液晶パネル40Rの交換時には、パネル枠板61のみを取り外して交換すればよいので、作業が簡単である。特に、新たなパネル枠板61の取付け作業においては、このパネル枠板61を固定枠板64の側に直付けにするとそのフォーカス位置が決定される。この取付け時のフォーカス位置の誤差が焦点許容深度内の誤差となるように、各部品を製造しておけば、パネル枠板取付け時にフォーカス調整作業が不要となるので、取付け作業が簡単になる。

【0096】なお、交換後、ねじ66を使わずに、第1の枠板62の外形の数カ所を固定枠板64に接着固定する方式を用いてもよい。

【0097】一方、図9に示すように、第1の固定枠板62の四隅のうちの対角線方向の2箇所の位置に盲穴62gを設け、これを利用して当該第1の固定枠板62を調整用装置によりチャッキングして、プリズム合成体22の面に対して位置決めすることが考えられる。前述のように第1の固定枠板62を接着固定するための接着剤が完全に硬化した後に調整用装置によるチャッキングを解除すればよい。このようなチャッキング用盲穴を設けておけば、その位置決め作業が簡単になる。

【0098】なお、チャッキング用盲穴62gは、第1の枠板62の外周部分にノッチ状に設けてもよく、さらに、固定枠板64の側壁64eに干渉しない部分の外形部分にチャッキング部分として係合部を構成してもよい。

【0099】

【発明の効果】以上説明したように、本発明の投写型表示装置では、光合成手段にライトバルブを確実に位置決め固定できるので、画素合わせのずれ量を抑え、フォーカス調整を正確に合わせられるので、より高精細化を容易に可能とする。加えて、ライトバルブ交換が可能な構造としながらも光合成手段を小型化できるので、商品の小型・軽量化に資するとともに、耐外乱に強い信頼性を高めた製品化を可能とする。ライトバルブと中間枠板もしくは固定枠板との取り付け部分は垂直方向の壁に配置することによって、冷却風の通気部分を設けられ、クーリング性能は確保できる。

【0100】加えて、製造面においては、光合成手段の光入射面に配置されるライトバルブを、ライトバルブ枠板によってその周囲を保護した状態で保持するようにしている。また、ライトバルブが保持されたライトバルブ枠板を、光合成手段の光入射面に接着固定した固定枠

板に対して着脱可能な状態で取付けるようにしている。従って、本発明によれば、ライトバルブの周囲がライトバルブ枠板で覆われて保護されているので、ライトバルブの取扱い時にそれが破損する等のおそれがない。また、外光が周囲から侵入してライトバルブに誤動作が発生することもない。さらには、ライトバルブに不具合が発生した場合には、光合成手段の表面を傷めることなくライトバルブのみを交換できるので経済的である。さらにまた、ライトバルブの交換作業を同じ製造装置によって簡単にしかも正確に行うことができる。

【図面の簡単な説明】

【図１】本発明を適用した投写型表示装置の外観斜視図である。

【図２】図１の装置の内部の各部品の配置を示す図であり、（Ａ）はその平面的な配置を示す図、（Ｂ）はその立体的な配置を示す図である。

【図３】（Ａ）は光学レンズユニットと投写レンズユニットの部分を取り出して示す図であり、（Ｂ）は光学系の概略構成図である。

【図４】ヘッド板および、そこに支持されているプリズムユニットおよび液晶パネルユニットの部分を取り出して示す部分斜視図である。

【図５】図４の液晶パネルユニットの構成を示す分解斜視図である。

【図６】図５の液晶パネルユニットの第１の変形例を示す分解斜視図である。

【図７】図５の液晶パネルユニットの第２の変形例を示す分解斜視図である。

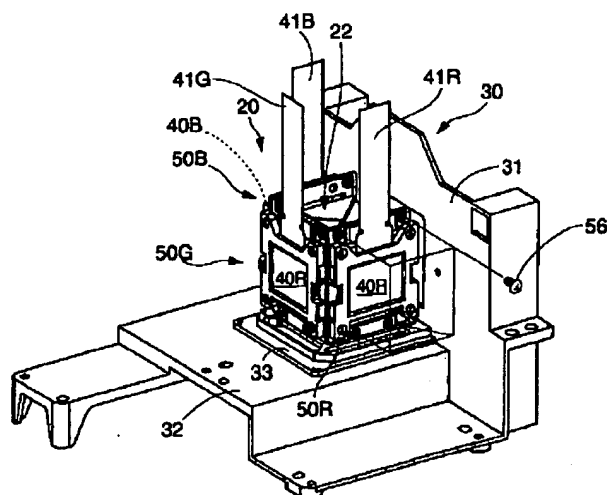
【図８】液晶パネルユニットの別の実施の形態を示す分解斜視図である。

【図９】図８の第１の固定枠板の変形例を示す斜視図である。

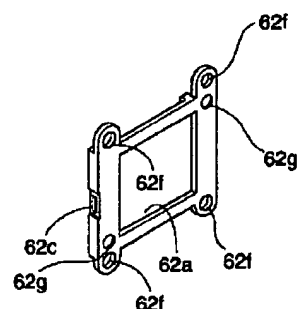
【符号の説明】

- 1 投写型表示装置
- 1 a 光軸
- 2 外装ケース
- 3 アッパーケース
- 4 ロアケース
- 5 フロントケース
- 6 投写レンズユニット
- 7 電源ユニット
- 8 光源ランプユニット
- 9 光学ユニット
- 20 プリズムユニット
- 21 プリズム
- 22 プリズム合成体
- 22 R、22 G、22 B 光入射面
- 30 ヘッド板
- 40、40 R、40 G、40 B 液晶パネル
- 50 R、50 G、50 B、60 R、70 R 液晶パネルユニット
- 51、61、71 パネル枠体
- 52、62、72 第１の枠板
- 52 b、64 e、72 b 周囲壁
- 53、63、73 第２の枠板
- 54、64、74 固定枠板
- 55、75 中間枠板
- 54 c、54 e、74 c ねじ孔
- 55 c、55 e、75 c ねじ孔
- 56、66、76 ねじ
- 55 d、75 d 係合突片
- 52 d 係合孔
- 53 c 係合突起
- 52 c、72 c 係合溝
- 52 e、64 g、72 e、72 f、72 g 楔案内面
- 57、67、77 楔

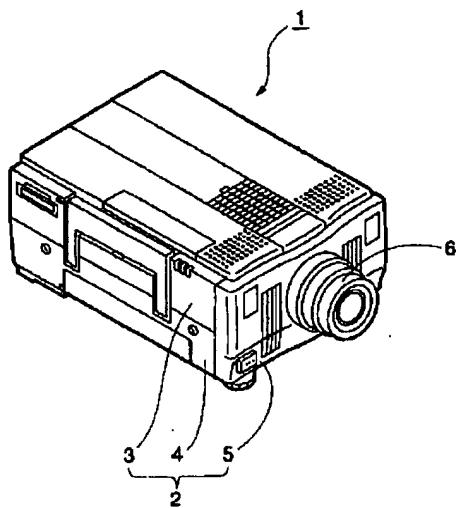
【図４】



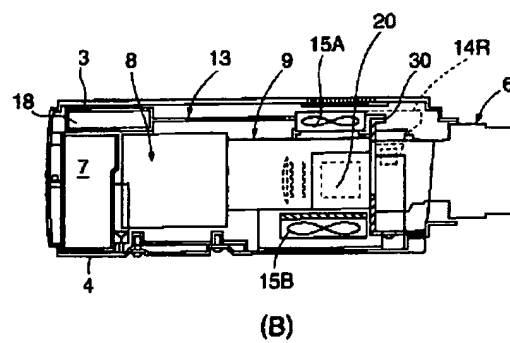
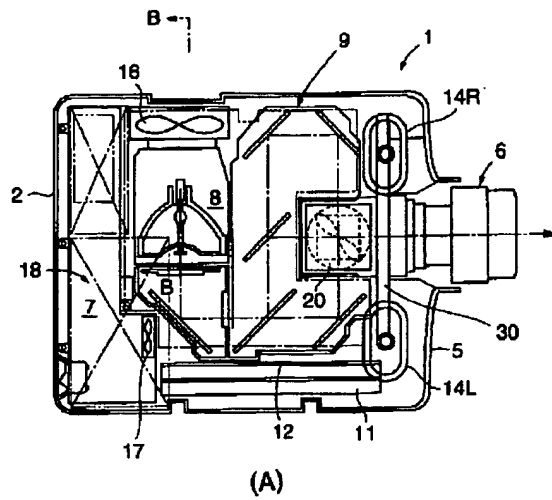
【図９】



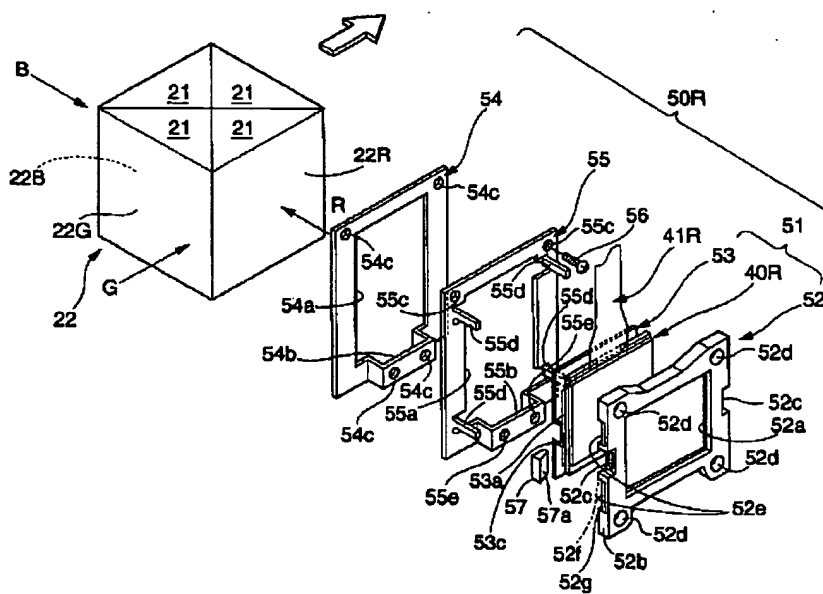
【図1】



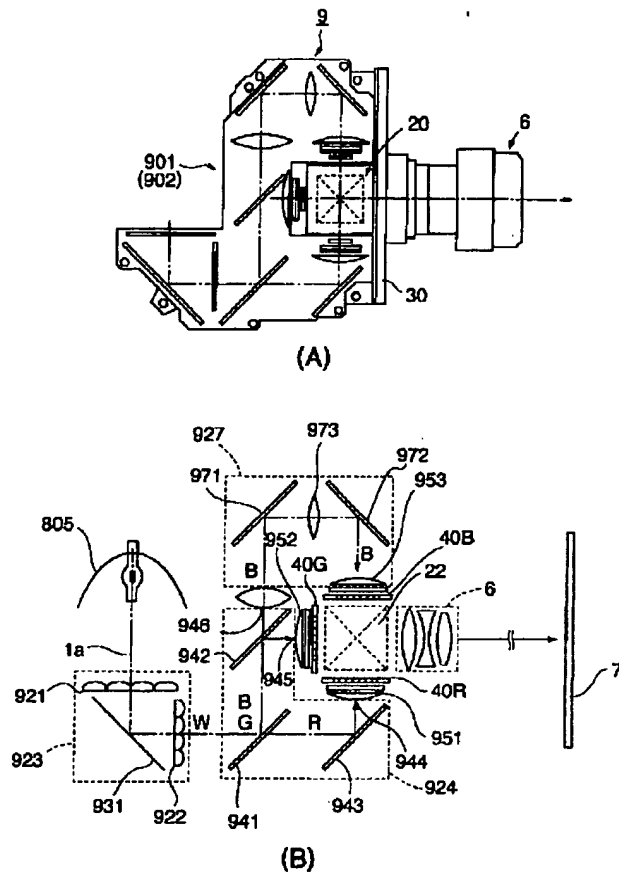
【図2】



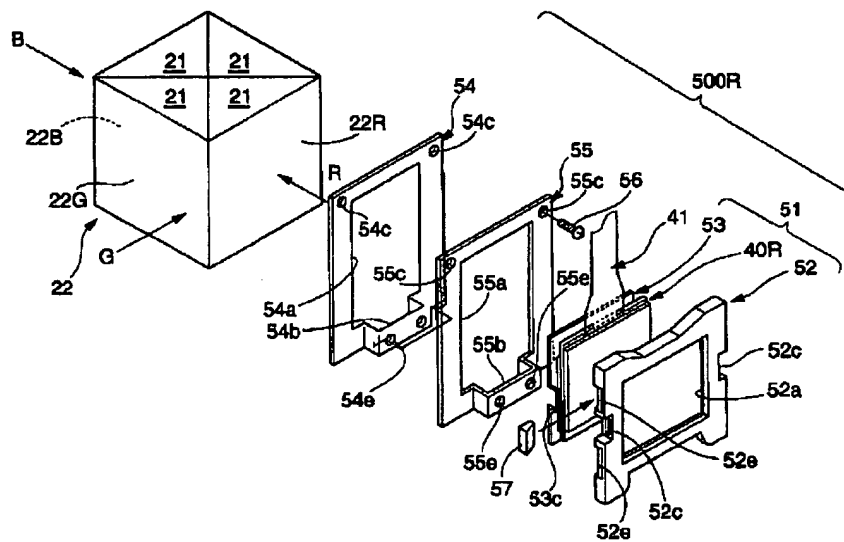
【図5】



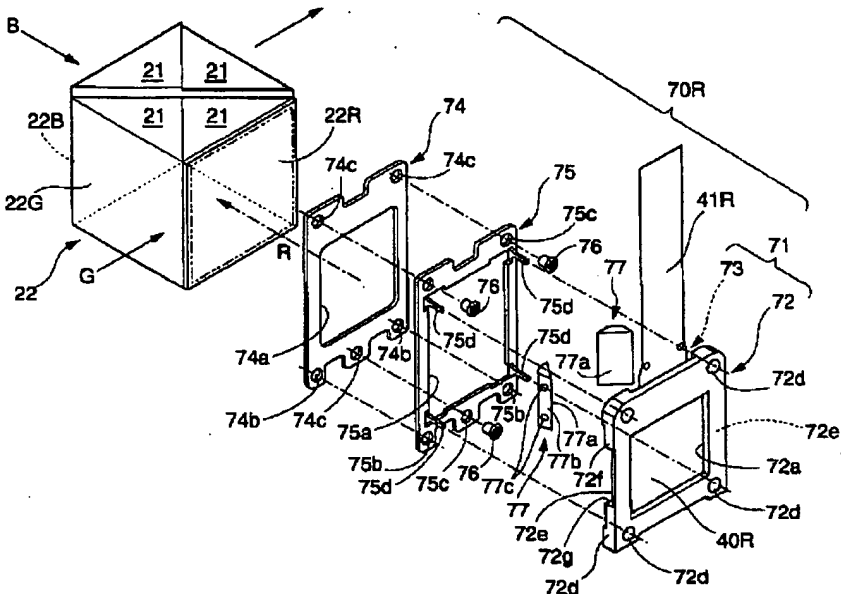
【図3】



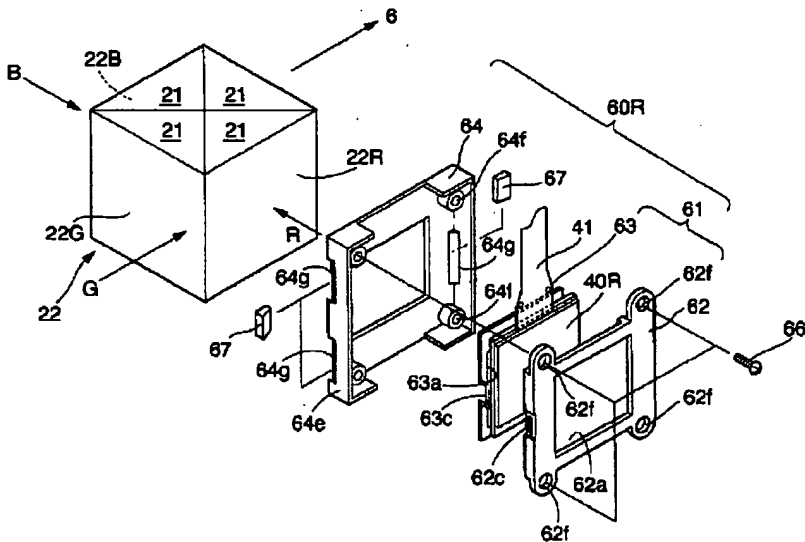
【図6】



【图7】



【図 8】



フロントページの続き

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